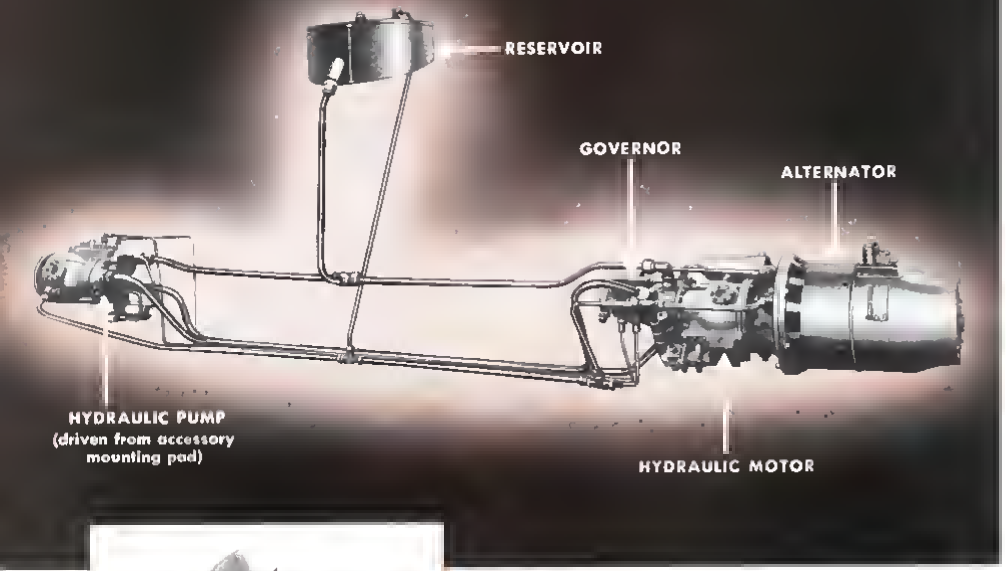
AVIATION WEEK

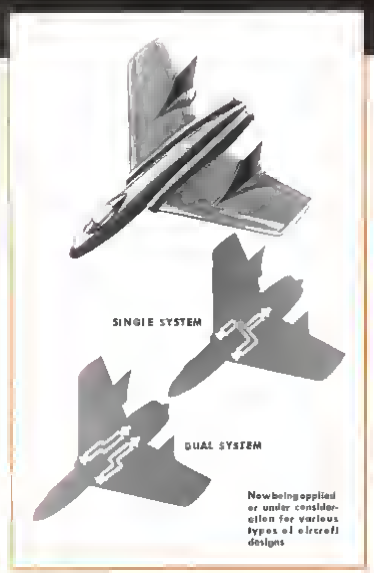
A McGRAW-HILL PUBLICATION

MAY 19, 1952

50 CENTS

HOW SUNDSTRAND'S "SPLIT DRIVE" TYPE CONSTANT SPEED DRIVE OPERATES





. . . drives alternator, accessories, also starts main engines

Extreme flexibility in aircraft design is permitted with this split type of Sundstrand Constant Speed Drive. Pumps may be mounted on two or more engines and their output combined to drive a single hydraulic motor with its attached alternator—or each pump may be used to drive a single hydraulic motor with its alternator. This Split System also may be used to drive other accessories such as hydraulic pumps and DC generators or used for starting the main engines by applying a source of electrical energy to the alternator. The alternator running as a synchronous motor will cause the hydraulic mechanism to feed back energy to start the engine. Get complete data—find out how Sundstrand's *reliable* research—*expert* engineering, and *precision* production may be used to solve *your* design problems.

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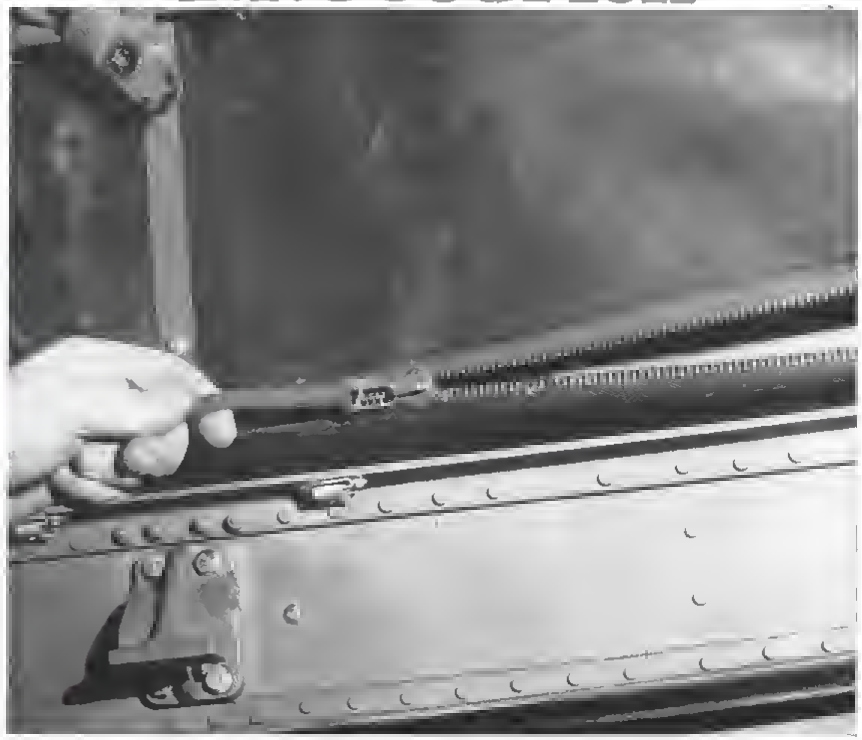

It lets men in – keeps fumes out

GASOLINE FUMES from the bomb bay fuel tanks in Lockheed's Neptune had to be kept completely away from equipment in the forward compartment. Yet the bomb bay couldn't be walled off because a ready entrance between the two compartments was needed. That called for an airtight curtain that would open in a jiffy.

Lockheed wondered if rubber might do the trick. They called in B. F. Goodrich. BFG engineers built a mammoth curtain to cover the entire width of the lower fuselage—made of fire-resistant fabric, coated with fume-resistant rubber. They made the curtain airtight—yet completely removable—by running a pressure sealing zipper all the way around the edge.

This B. F. Goodrich-developed zipper has overlapping molded rubber lips. They provide a 100% seal against fumes. And they make it possible to open the fume curtain in no time at all.

B. F. Goodrich fume curtains are now standard equipment on the Neptune.

Besides fume curtain applications, BFG pressure sealing zippers are used for airplane doors, air ducts, inverter covers, control surface seals. They are extremely flexible. They fit snugly around complex shapes—such as squares, kidneys and the like where clamps won't seal. They are available in light duty and heavy duty sizes. They cement right onto either fabric or metal. They save space and weight.

Other B. F. Goodrich products for aviation include tires, wheels and brakes, heated rubber, De-Icers, Avrim, Plastilock adhesives; inflatable seals, fuel cells, Rivnuts, accessories. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio*

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FIRST IN RUBBER

Aviation Week

ABC Member ABC

Volume 56 — May 19, 1952 — Number 20

41,691 copies of this issue printed

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Editorial Offices: 330 West 42nd St., New York 36, N. Y. Phone Longacre 4-3000, or (night) 4-3035, National Press Bldg., Washington 4, D. C., Phone National 3414.

Domestic News Bureaus: Atlanta 3, 1321 Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave., Cleveland 15, Hanna Bldg., Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St.; Houston, 514 South St. *Correspondents* in more than 60 major cities.

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Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Robert F. Boger
PUBLISHER

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May 19, 1952 — AVIATION WEEK — Vol. 56—No. 20
Member ABC and ABP

Published weekly by McGraw Hill Publishing Company Inc. James H. McGraw (1860-1948) Founder. Publication Office 99-129 North Broadway, Albany 1, N. Y.
Executive, Editorial and Advertising Offices: McGraw Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President, Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Earl Montgomery, Senior Vice President, Publication Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.
Subscriptions are solicited only from persons having a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.
Single copies 50¢. Subscription rates—United States and possessions, $8 a year; $9 for two years; $12 for three years. Canada, $9 a year; $18 for two years; $16 for three years payable in Canadian currency at par. other Western Hemisphere, $10 a year; $18 for two years; $25 for three years. All other countries $20 a year; $36 for two years; $40 for three years. Entered as second class matter July 17, 1947, at the Post Office at Albany, N. Y. under Act of Mar. 3, 1879. Printed in U. S. A.

NEWS DIGEST

Domestic

Postponement of the 1952 National Air Races until 1953 was announced last week by Ben T. Franklin, general manager. However, Aero Club of Michigan which co-sponsored last year's National Air Races at Wayne Major Airport, Detroit, will hold its annual air fair at the same time and location in conjunction with Air Force Assn convention and National Aeronautics Assn convention. Both will meet in Detroit over the Labor Day weekend.

International Air Transport Assn. last week called an emergency session in Paris as a result of the aviation gas shortage caused by the U.S. oil strike. A reported one-third cut in service was being discussed for most major European lines. Meanwhile at AVIATION WEEK press time, Wage Stabilization Board was seeking a pay setting formula for the 90,000 striking oil workers.

AIA Board of Governors' sixth semi-annual meeting at Williamsburg, Va., May 15-16, will feature joint industry-government conference on aviation production problems. The sessions will be closed because of their classified nature.

Henry W. Fowler has been nominated by President Truman to succeed Manly Fleischmann as Defense Production Administrator. Fleischmann, reportedly resigning June 1, had been offered Charles E. Wilson's former post as Defense Mobilizer, but declined it.

New international distance record for Category II aircraft was established May 1 by Max Conrad flying a Piper Pacer Los Angeles-New York nonstop (2461 mi.). Conrad made the hop in 24 hr. 54 min. Previous mark was 2,156 mi. set in 1950 by the late John F. Mann.

Flight Safety Foundation has named Theodore Wright, J. Carlton Ward, Jr. and Reginald M. Cleveland to its governing board.

Port of New York Authority has awarded a $3,331,987 contract to Turner Construction Co., N. Y., for superstructure of new $8-million passenger terminal building at Newark Airport. It is scheduled for completion in 1953.

Paul Fisher, United Aircraft Corp., director of public relations, planned to return to his East Hartford, Conn. home last week following an abdominal operation at Hartford Hospital. After several weeks' convalescence he is to undergo further surgery.

THE WRAPS CAME OFF USAF's two new heavyweight bombers last week, when Air Force declassified general exterior details of the eight-jet Boeing YB-52 and Convair YB-60. This photo, just released, shows the security-draped form of the YB-52 after it was rolled out of Boeing's Seattle plant at about 3 a.m., Nov. 29, 1951. Other pictures of the YB-52 and YB-60 appear on pp. 14-15 of this issue.

Martin XB-51 three-jet bomber crashed and burned at Edwards AFB, Calif., May 9 while performing a low-level flight maneuver at moderate speed. The USAF pilot was killed. Cause has not been determined. The only other XB-51 built is being returned to the Martin plant for repairs following an "undershoot" landing at Wright Patterson AFB, Dayton.

Gen. Nathan F. Twining is acting USAF Chief of Staff while Gen. Hoyt S. Vandenberg convalesces following an "exploratory" abdominal operation at Doctors Hospital, Washington.

Financial

Solar Aircraft Co., San Diego, reports unaudited sales of over $51 million for the fiscal year ended Apr. 30, double the sales for the previous fiscal year.

G. M. Giannini & Co., Pasadena, Calif., aircraft and missile instrument maker, had sales of over $1 million for the first quarter of 1952. Sales for entire 1951 were $2,571,379. A typographical error was made last week in printing these sales figures.

Bell Aircraft Corp., Buffalo, N. Y., notes sales and income of $24,180,491 for the first quarter ended Mar. 29, with net profit after taxes being $367,781. Net profit was nearly identical to the 1951 figure in spite of nearly $1-million increase in quarterly sales.

Trans World Airlines reports a net loss of $552,923 for the first quarter of 1952 despite more than $3 million increase in gross revenues over same period last year.

Temco Aircraft Corp., Dallas, had net earnings of $315,000 on gross sales of $10,054,000 for the quarter ended Mar. 31. Temco's backlog as of Mar. 31 was $198.5 million.

Lockheed Aircraft Corp., Burbank, Calif., has declared a 30 cents per-capital share dividend payable June 13 to holders of record on May 23.

Chicago & Southern Air Lines has declared a dividend of 15 cents per share of common stock payable June 16 to holders of record June 2.

International

Indian navy has ordered ten Short Sealand amphibians for communications duties, with first delivery expected to be made toward the end of this summer.

Trans-Australia Airlines has ordered five Vickers Viscount turboprop transports. Delivery dates are "not yet certain."

Hawker Hunter "super priority" fighter for RAF is also to be built by Gloster Aircraft Co.

KLM DC-6 which crashed in a Frankfurt, Germany, suburb on Mar. 22 killing 43 of 47 aboard encountered inadvertent prop reversal, according to the best information that is now available.

AVIATION CALENDAR

May 19—International Air Transport Assn. technical committee and medical committee meeting, Copenhagen.

May 20—Institute of the Aeronautical Sciences meeting, Cleveland-Akron section, Cleveland.

May 21—International Air Transport Assn. financial committee meeting, Rome, Italy.

May 22—American Rocket Society dinner, Hotel Astor, New York.

May 22-23—Aeronautical Training Society annual meeting, Carlton Hotel, Washington, D. C.

May 28-June 1—Wright Memorial Glider Meet, South Dayton Airport, Dayton.

May 31—Philadelphia Aviation Country Club annual spring regetta, Wings Field, Ambler, Pa.

June 1-3—Airport lighting conference and seminar, sponsored by American Association of Airport Executives, Deshler-Wallick Hotel, Columbus, Ohio.

June 1-6—Society of Automotive Engineers summer meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

June 3—Council for military aircraft standards, Aircraft Industries Assn., meeting, Hotel Statler, New York.

June 4-6—California Association of Airport Executives & California Aviation Trades Assn. conference, Stockton, Calif.

June 9-13—National Fire Protection Assn. annual meeting, aviation seminar on June 10, Hotel Statler, New York.

June 15-19—American Society of Mechanical Engineers semi-annual meeting, Sheraton-Gibson Hotel, Cincinnati.

June 16-17—Aviation Distributors and Manufacturers Assn. mid-year meeting, The Grand Hotel, Mackinac Is., Michigan.

June 17-19—Aircraft Trade Shows international exhibit of aircraft parts and equipment, Hotel Park Sheraton, New York.

June 24-26—Ignition and engine analyzer conference, sponsored by Scintilla Magneto division, Bendix Aviation Corp., Sydney, N. Y.

July 8-12—Aviation Writers Assn. annual convention, Ambassador Hotel, Los Angeles.

Sept. 2-7—Society of British Aircraft Constructors annual display, Farnborough, England.

Sept. 15-19—International Air Transport Assn. eighth annual general meeting, Geneva, Switzerland.

PICTURE CREDITS

7—Boeing; 13—Piasecki; 14—Convair; 15—Boeing; 16—USAF; 12—Wide World; 25—Douglas; 36—White Mortar Co.; 32-40—Gulf Oil Corp.; 45—Boeing; 68—GE; 90—Charleston (W. Va.) Gazette.

Washington Roundup

Finletter: Dwindling Popularity?

Attitude of many Air Force military personnel toward Air Secretary Thomas Finletter and his assistants is cooler. Main reason: They feel he has compromised with the Administration where USAF's first secretary, Stuart Symington, bucked it and successfully carried the banner for a bigger USAF to Congress.

Naval Air, though, is now content under its civilian command, headed by Secretary Dan Kimball. His predecessor, former Secretary Francis Matthews, was automatically ruled out of Navy popularity by the fact he was top replacement for the Navy command that went down fighting for Naval Aviation.

Poor Defense Strategy?

Defense Department waited until the House drive to slash defense money had snowballed into an avalanche before putting on the heat to melt it.

• **Too easy to please?** In his appearance before the House Appropriations Committee, Air Secretary Finletter expressed satisfaction with the $22.4 billion USAF budget recommended by the Administration. "I would like to say that we would not hesitate to recommend to you a higher force if we thought ... it was right to ask for it," Finletter volunteered. For congressmen, who go by the rule-of-thumb that the military always ask for more than they need, this was a green light to go forward with cuts.

Two and a half months later, after determinations to slash USAF's budget had jelled, Finletter made a reappearance to plead against it. He urged: "This committee ... must protect us against these assertions that you can cut this Air Force budget ... without interfering with the national defense ..." The committee itself slashed off $1.5 billion.

• **Slip-up on Vinson?** Influential Chairman Carl Vinson of House Armed Services Committee early fell in step with the economy bloc, campaigned among his colleagues for a minimum $6-billion cut in the defense budget. And Vinson's campaigning had gone too far for a complete backtracking—after the three services belatedly confronted him with the effect cuts would have on armed strength and won him over from the economy bloc.

The backtracking—he supported the $4.2-billion cut with the qualification he thought it was "too much"—subjected Vinson to needling in House debate.

Appropriations Committee chairman Rep. Clarence Cannon, chided: "For some time (Vinson) has been importuning me and other members ... insisting that the estimates be reduced $6 billion. He buttonholed me in the cloak room, he stopped me in the restaurant, he waylaid me in the corridors; he came and sat with me on the floor, always the burden of his discourse was $6 billion. Unconditionally, unequivocally, we must cut by $6 billion and take out the flat top—the big aircraft carrier. So what was my astonishment, when, after we had taken out only $4.2 billion, he said, 'You have cut the budget too much, you have gone too deep.'"

This marks the first time in a 38-year congressional career that Vinson has sought to outdo an Administration in economizing on defense. In other years he has succeeded in mobilizing support in Congress for larger Navy and Air Force budgets than recommended.

Spending Ceiling

Senate Appropriations Committee is set to take off the $46-billion defense spending ceiling clamped on by the House.

The ceiling would mean a slowdown of aircraft and engines on the production line—because USAF and Navy couldn't pay for deliveries. Even though they have the money, they couldn't spend it.

Chairman of the Armed Services Subcommittee, Sen. Joseph O'Mahoney, commented: "It's about unanimous in the committee that it would be very dangerous to, in effect, repeal former year appropriations."

In the final outcome, you can expect Congress to put some brake on military spending, but less stringent than that voted by the House—which would impound $6 billion of the $52 billion the services expect to spend over the coming 1953 fiscal year, which starts July 1, for hardware already on order.

Sinking the Carrier

House Appropriations Committeemen, who banned construction of a second 60,000 ton flush-deck carrier, are skeptical of Adm. William Fechteler's offer to cut other shipbuilding $210 million and build the carrier.

Rep. George Mahon, chairman of the Defense Subcommittee, commented: "The Navy knows that there are certain basic vessels—minesweepers, destroyers—that it must have to operate and that Congress cannot deny it. For the Navy now to say it will do without these if it can have the carrier is like asking for a car, and offering to do without the wheels and batteries. Sooner or later the wheels and batteries must be supplied or the car can't operate. Also, a new carrier means additional support vessels and aircraft in future years."

Navy says no. That in a given area no more support vessels are required for two carriers than one, that the new carrier would replace an outmoded one and there would be no greater aircraft requirement.

Here & There

Airmail postage hike. Legislation boosting postage rates is out indefinitely. Administration wants it, but hasn't yet submitted a bill to Congress for introduction. And House Post Office and Civil Service Committee doesn't plan to consider it at this late date. It would be one more block to an early adjournment for the July political conventions.

Aro, Inc. investigation. Expect House Armed Services Committee to let it die by inaction. Main reason: Rep. Dewey Short of Missouri—the home state of Aro's parent corporation, Sverdrup & Parcel, and of Aro's stockholders. He's the ranking Republican on the committee. After a preliminary investigation, House Appropriations Committee banned use of USAF money for Aro to operate Arnold Engineering Development Center, referred the matter to the Armed Services group for further review. An attempt by Short on the House floor to remove the ban failed. Appropriations Committeemen objected to the size of fees being paid Aro, were skeptical of ex-Air Secretary Symington's role in the formation of the corporation, and questioned the qualifications of ex-USAF publicity man, Steve Leo, for a key post with the firm.

—Katherine Johnsen

WHO'S WHERE

In the Front Office

John W. Hutchinson is being considered as vice president sales and traffic of European American Airlines in event the carrier succeeds in obtaining a trans-Atlantic cargo certificate, according to EAA's president Theodore T. Ludlum. Hutchinson for ten years was district sales manager in Chicago for Northwest Airlines and also served NWA as Washington representative and sales manager in that area for a period of three years.

Changes

Lorne S. Waddell has been appointed assistant public relations manager of Fairchild Aircraft division. He comes from Syracuse University where he was director of public information.

W. F. Moore has been designated manager aviation department of General Electric Co.'s Pacific Northwest District with headquarters in Seattle. **C. R. Flam** who formerly held this position has been transferred to GE's Aircraft Nuclear Propulsion Project with headquarters located in Lockland, Ohio.

Don Downie, western editor for Skyways magazine and aviation writer-photographer for the Pasadena Star-News, has joined Fletcher Aviation Corp., Pasadena as factory pilot and public relations writer. **Howard E. Payne, Jr.**, has been named as the California company's Dayton, Ohio representative.

P. G. Crabbe has been promoted to managing director of Gloster Aircraft a member of the Hawker Siddeley Group.

Raymond R. Leonard and **David Gunshaw** have been named manager and assistant manager respectively of the newly formed spare parts division of the Wright Aeronautical Sales department.

Giles J. Strickroth has been promoted to head Glenn L. Martin Co.'s Electronics Projects section as part of the company's reorganization of its Electronics department. **Sanford Hershfield** has been placed in charge of the Radio Frequency section and **Dr. Fred B. Haynes** is in charge of the Product Service section.

Joe Conlon has been made manager of public relations, Washington, D. C. for Trans World Airlines. **Milton Gamson** has been named director of analysis and reports for the carrier succeeding **Henry McGrew**, who will enter private business. He will be based in Kansas City.

Honors and Elections

Dr. Harold B. Dye, Trans World Airlines director of medical service, has been installed as president of the Airline Medical Directors Assn.

George S. Chamberlain has been named a director of Schweizer Aircraft Corp., Elmira, N. Y. He is a sales engineer for the firm's new products division.

Louis L. Berg, vice president-sales for U. S. Airlines has been elected to the carrier's board.

INDUSTRY OBSERVER

► New Ryan built wing tanks for the Boeing B-47B have a capacity of 1,780 gal. each, according to the sign painted on the tanks of nearly one-half more capacity than the 1,200 gal. wingtip tanks used on the North American B-45. The B-47 tanks are believed the biggest now in use anywhere.

► Latest version of Robert Edison Fulton's Airphibian two-place flying automobile, has a new full cantilever wing adapted from the wing used on the Goodyear GA-2 amphibian. Other innovations besides a glamorous new paint job include a new drive transmission to the wheels of the automobile component.

► Piper Aircraft Corp. recently took a look at the Helioplane, the four-place slow flyer developed by Prof. Otto Koppen of MIT and Prof. Lynn Bollinger of Harvard Business School, with a view to possible production, but decided not to try it just now. Aeronca Aircraft Corp., which was to have manufactured the plane, dropped out of the picture some time ago. Industry reports are that the plane may be produced somewhere in Texas.

► Three Marine HRS helicopters, similar to the Sikorsky S-55 Los Angeles Airways machine, have experienced the same trouble with the transmission to the tail rotor and a general fix has been ordered for all military and civilian models of the copter. The fix includes a series of small clamps at the points where links could let go. Presumably the shaft will be redesigned later to eliminate the weight penalty which these involve.

► Boeing Airplane Co. reportedly has some new interest in Stratocruisers from airline customers. About the only way these could be provided would be for Air Force to permit Boeing to divert a few of its C-97 Stratofreighter cargo planes for modification to commercial passenger version. Boeing closed out its commercial Stratocruiser production line about two years ago, after running off 55 planes.

► European sources describe the new night-fighter version of the Russian MiG-15 as having a two-place arrangement, with its fuselage lengthened forward of the wings. It has a radar-nose similar in outward appearance to that of the F-86D Sabre. Wings and horizontal tail are similar to those of the MiG-15 but have rounded tips. Vertical tail is moved forward enough so that rudder trailing edge is at tailpipe exit instead of farther aft; horizontal tail has been lowered about 2 ft. on the vertical fin.

► A Russian navy version of the MiG-15, with folding wings, and a two-seat navy dive bomber with radial engine are equipment for three Soviet aircraft carriers now reported to be in service.

► Piasecki Helicopter Corp. now claims it is the largest rotary wing aircraft manufacturer in the world, space-wise, with approximately 400,000 sq. ft. in its main plant at Morton, Pa., plus 162,000 sq. ft. in a leased plant.

► Republic Aviation has signed a contract with Finmeccanica of Italy for production of Republic F-84 Thunderjet spare parts at factories in Naples and southern Italy to supply the planes being used by European nations under the Mutual Defense Assistance Pact. Plan calls for the Italian firm to make about 1,600 components of the F-84, which include some 8,000 parts.

► Irving Air Chute Co. is installing newly developed stainless steel springs in military parachutes to replace rubber cords formerly used to spring open the chute as the ripcord is pulled. The new arrangement is considered more fool-proof in opening chutes at high altitudes and in extremely low temperatures.

► Navy's use of Piasecki HUP and Sikorsky HO3S-1 helicopters for hydrographic survey work in the Caribbean is estimated to have cut in half the time required for individual survey missions.

AVIATION WEEK MAY 19, 1952 VOL. 56, NO. 20

CAB Proposes Jet Transport Subsidy Plan

- **Each builder would get funds under program.**
- **But most manufacturers oppose direct subsidies.**

By F. Lee Moore

Spurred by British operation of jet transports already in competition with U. S. flag airlines, CAB Chairman Donald Nyrop last week proposed a new plan to subsidize any U. S. aircraft manufacturer who will design and build 15 jet transports.

Nyrop offered his plan to the Senate Interstate Commerce Committee last week during hearings on four other bills proposing various ways of subsidizing jet prototype development and testing.

The Nyrop plan calls for government donation of $15 million to each manufacturer who builds 15 jet transports. In effect, here's how it works: The government would loan the manufacturer $15 million at 1% interest. But he doesn't have to pay it back if he builds 15 planes. For each of the first 15 planes he builds and sells, the government automatically cancels $1 million of the debt. Delivery of the 15th plane closes out that part of the deal.

▶ **Realistic Figure**—Then CAB would subsidize 12 months' cargo-flight operation of the jets by the airlines buying them.

Details of the Nyrop plan include a theoretical limit on the government loan at 75% of the estimated development cost, or a maximum of $15 million. Since jet transport plane development estimates all run at $20 million or more, the $15 million figure is considered a realistic one.

The plan also calls for repayment of any balance due on the loan ten years later, in case the manufacturer doesn't build 15 planes. The government write-off guarantee of $1 million for each of the first 15 planes is technically contingent on sale, rather than merely construction of, each plane.

▶ **Partial Subsidy**—Since the manufacturer could sell the planes below cost because of the $1 million subsidy on each one, it is assumed he would be able to sell every one of the first 15 planes and claim the total subsidy.

Board Views on Subsidy Bills

Civil Aeronautics Board Chairman Donald Nyrop last week summed up the Board's views on four aircraft development subsidy bills now up for congressional consideration:

- **Construction differential** bill to pay international airlines the difference between cost of foreign and U. S. planes (S. 2344) should include all U. S. airlines—not just international lines.
- **Commercial air fleet** bill calling for $100 million for a government agency to sponsor development and buy transports—then lease them to civil operators (S. 481) development sponsorship is good but the buying program is too expensive and unnecessary, considering that there are already 1,666 airliners operating and on order.
- **Local service prototype** bill providing $8 million for development of an economical local service transport (S. 1402)—not favored by the Budget Bureau, but urged by CAB to help reduce the present operating subsidy requirement of local lines using the obsolescent DC-3.
- **Military reserve prototype** bill to sponsor, buy and test new civil transport types adaptable to military reserve needs (S. 477) should be restricted to jet development and should have a specific plan on how it would induce manufacturers to build new types now.

In his testimony, Nyrop points out that this is only a partial and indirect subsidy. A manufacturer's development cost actually would run close to $40 million, Nyrop says.

He says there still is a big gamble for the manufacturer in putting up the remaining $25 million unsubsidized development cost and the production tooling investment. But, says Nyrop, the plan would help the manufacturer over the worst hump.

▶ **Industry Reaction Mixed**—Manufacturers testifying on jet transport development, generally opposed direct subsidy but favored government aid in planning, testing and operation.

- **Boeing** President William Allen presented just that recommendation.
- **Convair** President Joseph McNarney urged that Congress appropriate the $1.4 million of jet testing money asked by the President in the 1953 budget under the $12 million aircraft testing authorization passed by Congress three years ago. "We can decide what's needed next after that program, not now," McNarney said.
- **Glenn L. Martin Co.** President George Bunker said the military should develop transport aircraft for their own needs, then with development cost largely written off, airlines could order civil versions. Martin's recent financial reorganization was the result of building airliners without securing military orders, too, Bunker pointed out.
- **Douglas** President Donald Douglas said his company will build jet transports as soon as they are economically practical—probably by about 1956 or 1957. That's when available jet engine fuel economy will compete with reciprocating engines, he said.

"We do not want government assistance because it inevitably carries with it limitations, controls, and influences which make it more difficult to do the job the way we know it has to be done," he said. Meanwhile, he concluded, the British "will not capture a very large proportion of the market before we get into it and have available something which is a marked step ahead of them."

- **Lockheed** President Robert Gross backed Douglas with a plea for continued normal economics in transport development.

Government interference, in the end, would slow, not speed, proper development, he said, and might bring monopoly into the business. Development will be strongest "without special government legislative aid and within the framework of the normal commercial relationship if the airlines can be kept in strong financial position and if the military and naval authorities will buy," he said. If that doesn't come about normally, as Lockheed expects it will, then Lockheed might favor some legislation like the construction-differential bill now before Congress.

But all manufacturers except Douglas favored the current jet planning and testing program asked in the 1953 budget. Douglas didn't mention the program.

▶ **Airlines Uncommitted**—Air Transport Assn. General Counsel Stuart Tipton favored the jet planning and testing program. He said the House has rejected these programs twice "by reason of a firmly fixed misunderstanding of the purpose of the appropriation." This testing program is not a subsidy to airlines and manufacturers, he said, it is to help government authorities plan airways, airports and regulations for the coming jet era.

Representing ATA, Tipton skirted the issue of whether big airlines will or will not need subsidized development of jets later. He did favor a pending bill to amend the testing authorization to provide money for development of a modern, small, conventional local service airliner to replace the obsolescent DC-3. But even that, he said, may not be needed. Canadair may build one on speculation, the local airlines and Canadair are working to that end now, he said.

▶ **Air Force**—The Air Force said it doesn't need a jet transport development now, and doesn't want any diversion of engineers and facilities from military programs now to develop a jet airliner.

AF Pilots Test Britain's Planes

(McGraw-Hill World News)

London—Gen. Albert Boyd, senior USAF test pilot and vice chief of Wright Field Air Development Center, spent last week looking over Britain's best in high-speed aircraft.

Gen. Boyd, with Lt. Col. Richard Johnson, present holder of the world's speed record, and Col. Fred Ascani, chief of Wright Field's Bomber Flight Test Section, flew comparison trials of the Hawker Hunter, the de Havilland DH 110 all-weather fighter and an AF F-86. A joint report will be drawn up soon.

The trio also visited Vickers-Armstrong to look over the Valiant II, four-jet bomber which flew for the first time only last month, and the Vickers Supermarine Swift ordered in quantity by the RAF. Weather prevented comparison trials of the Swift and the Gloster CA 5, twin-jet all-weather fighter which the group also saw. At de Havilland, the Americans flew in the Comet.

The Americans flew the trials in pairs: one pilot in a British craft, one in an F-86.

The trial pilots were in cockpit-to-cockpit radio touch and were able to "pace" both the Hunter and the DH 110. The pilots took a turn at the controls of each aircraft.

TANDEM ROTORS lift Piasecki's YH-21 gracefully in demonstration flight.

Piasecki Discloses YH-21 Details

Piasecki Helicopter Corp. disclosed last week that its new YH-21 Work-Horse helicopter is capable of operations with an overload gross weight of more than 14,000 lb. and has "substantially greater" load-carrying capabilities than any other helicopter now in use by the military.

Now on order are four versions of the basic H-21 model. The YH-21 and H-21A are rescue helicopters for the Air Rescue Service operated by MATS, while the H-21B is an assault transport for USAF, and the H-21C an Army troop carrier and resupply transport. All versions are powered by Wright R1820 engines, ranging in power from 1,150 to 1,425 hp.

Cargo compartment, 20 ft. long, has all metal floor with skid rails for cargo handling and tie-down fittings. Brackets are provided for installing 12 litters in the rescue version in four tiers of three litters each with center aisles. Rescue version carries 14, but transport versions will have seats for 20.

▶ **Advantages**—Other features provisions for a hydraulic hoist which will lift 400 lb., front and rear cargo doors at Army truck levels, with sufficient rotor clearance for trucks at both doors in static dropped rotor blade position. Sufficient blade clearance for most trucks is provided, even when the blades continue to turn in readiness for a fast takeoff, the manufacturer says.

The large center-of-gravity range longitudinally, made possible by the tandem rotor configuration, amounts to 53 in. travel, permissible without disturbing the aircraft's flight control characteristics, it is stated.

Cargo too large to get into the cabin can be carried in an external cargo sling suspended from the helicopter. A quick release mechanism fitted on the sling can be operated either from the cockpit or cargo compartment.

▶ **The Future**—The YH-21 made its first press demonstration flights at the Philadelphia Airport plant operated by Piasecki.

With an estimated life of 3,000 flight hr., it is calculated that an H-21 transport helicopter could fly approximately 195,500 ton miles, and that one helicopter could fly a 110 mi. mission in one hour, while it would take a truck eight hours to complete the same length mission with two drivers.

Plane Off Limits

Frankfurt—That Berlin-bound Air France airliner was definitely and indisputably outside the internationally approved corridor when it was attacked Apr. 29 by Russian fighter planes, AVIATION WEEK has learned.

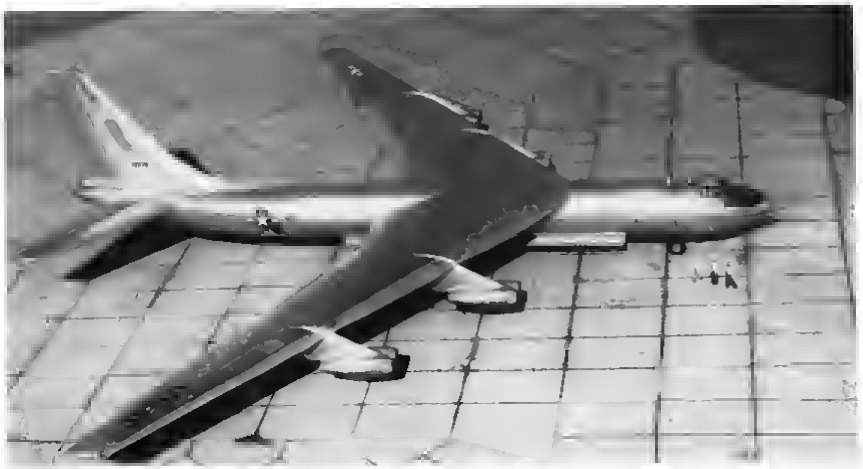
Well informed sources on the Continent, noting Secretary Acheson's public statement excoriating the Russians for the attack, are convinced the diplomats over here failed to tell their boss the facts of life in this particular incident.

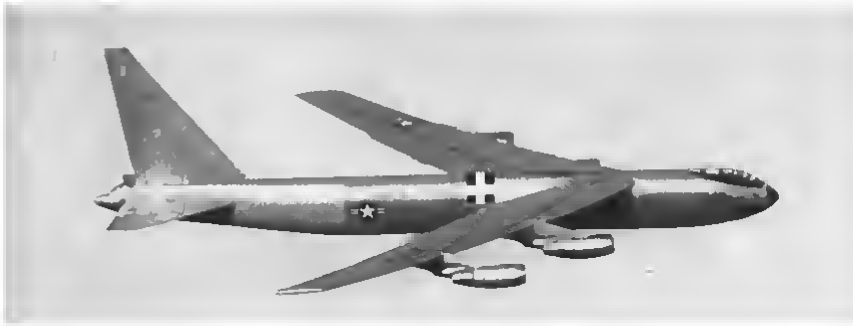
Trend in Turbojet Powerplants Told

Tomorrow's turbojet engine designs will be aimed at higher capacities of air flow with lower pressure ratios. Operating temperatures will have to be somewhat higher, and special augmentation methods will be developed.

This is the trend in turbojet powerplants, says Abe Silverstein, chief of research at the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics.

Silverstein, addressing the New York section of the Institute of the Aeronautical Sciences, said that the basic problem of supersonic propulsion is providing sustained thrusts on the order of five times current values for reasonable flight duration. The way to do this, he said, appears to be with high-flow turbojets or ramjets.





Here Are USAF's Sluggers: Convair YB-60 and Boeing YB-52

With initiation of flight test programs of the Convair YB-60 (above) and the Boeing YB-52 Stratofortress (facing page), USAF has announced that general exterior details of its new jet-powered heavyweight global sluggers no longer are classified and has released these unretouched views taken from various angles.

Brief details of the bombers are also made public, with official approval.

► **YB-60**—Largest all-jet bomber known to be flying, the Convair YB-60 spans 206 ft., some 24 ft. less than its predecessor, the B-36. But it is longer and higher than the B-36, having a length of 171 ft. and height of 60 ft. 9 in. (to top of the rudder).

It is powered by eight P&W J57 turbojets producing a total of approximately 80,000 lb. thrust, slung under the wings in pods which were developed by the Boeing company.

Wing sweep was accomplished by inserting a wedge-shaped structure at the extremity of the center portion of the center wing. This necessitated putting a cuff on the leading edge of the center wing to continue the sweep line to the fuselage.

The plane has an extra landing gear near the fuselage rear to protect the tail section.

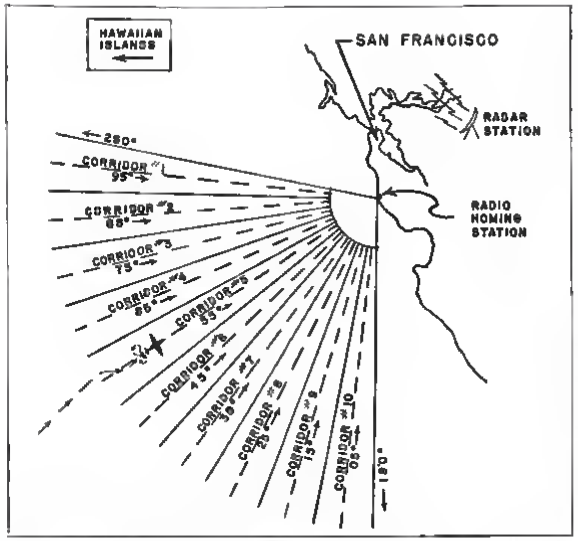
USAF let the YB-60 contract Mar. 15, 1951, and the first of two airframes ordered was ready for engine installation only eight months later. The plane flew Apr. 18 at Ft. Worth, 12 days after rollout. No production contract has been revealed.

► **YB-52**—Boeing's big bomber, although superficially a design progression of the B-47 Stratojet, is an entirely new airplane, incorporating lessons learned in design and testing of the smaller Stratojet, examination of the photos reveals. The B-52A is the production version.

The YB-52 Stratofortress spans 185 ft., is 153 ft. long and height to the top of the swept tail is 48 ft. Like the YB-60, it is powered by eight P&W J57s slung under the wings. In the case of the YB-52, this was to permit a thin, high-speed airfoil section.

Landing gear is a complex installation retracting into the fuselage, port wheels going forward, starboard wheels folding to the rear. Small outrigger landing gears near the wing tips maintain balance on the ground.

Study of the close-up view of the tail (right) reveals that angle of the horizontal surfaces can be varied considerably to provide effective control at very high speeds.



MULTIPLE CORRIDOR aircraft identification system protecting San Francisco, with plane (corridor No. 5) shown performing identifying maneuver

New Air Defense System Details

(McGraw Hill World News)

San Francisco—Western Air Defense Force's new multiple corridor aircraft identification system, placed in permanent operation last March, is reported to have reduced jet interceptor scrambles in that area by 75%.

The new system, called "Perma-Porpoise," places responsibility of proper identification of aircraft incoming to San Francisco from Hawaii on the planes' crews instead of Air Force. A pilot leaving Hawaii is given sealed orders to be opened when he passes the point of no return. Orders tell him which of 10 corridors fanning out of San Francisco south and west he should enter and include a check turn, a code word and a complicated maneuver.

If the plane does not identify itself satisfactorily, a jet interceptor scramble is called.

▶**Cuts Cost**—By cutting the number of scrambles (previously required if an aircraft strayed from its flight plan more than 5 min. or 20 mi.), the new system reportedly has cut costs by about $1 million a month.

Perma-Porpoise, developed by Lt Col A. T. House, deputy for operations, 28th Air Division, is a refinement of a system used in combat zones during World War II. Similar setups are planned at Los Angeles and Seattle.

At a day-long briefing of representatives from the 11 states in WADF last month, all phases of the defense operation were reviewed by Maj. Gen. Walter E. Todd, commanding officer, with particular emphasis on Perma-Porpoise, Conelrad tests controlling radio broadcasts during an emergency, and the volunteer civilian ground observer corps which went on 24-hr. duty this month.

Conelrad (Control of Electromagnetic Radiation) tests were highly satisfactory, Vernon Esgar, representing the Federal Communications Commission, reported. "Enemy" navigators were thrown as much as 150 mi. off their bombing targets by erratic radio compasses.

▶**How It Works**—The system calls for radio stations within a metropolitan area to carry a common program on a specific frequency when enemy aircraft are detected. A central control switches from station to station every 15 sec. in a random sequence so only one station is broadcasting at a time. Thus, the stations cannot be used by the enemy for navigational purposes.

Col. Owen F. Clark, WADF director of civil air defense, reported that 35,000 volunteers will man the 1,800 observer posts now established in the 11-state area under "Operation Skywatch." Eventually, there will be 3,000 posts. Approximately 50,000 volunteers have signed up for duty, he said.

C-W Head Calls For New Industry Policy

A study on "the financing of air power" compiled for and released by Curtiss-Wright Corp. shows need for a "national policy for the aircraft industry," says Roy T. Hurley, C-W chairman and president.

"Strength of our Air Force," Hurley said in a foreword, "depends upon the strength of our industry," and a policy is needed which will have as its objectives "production of aircraft at reduced cost, in the quantities desired and within the time limits imposed by national security."

The survey was made for Curtiss-Wright by Selig Altschul, head of Aviation Advisory Service, New York. Altschul, who writes for AVIATION WEEK's financial page, covered the financing of air power under five headings: incentive policy as encouraged by Congress and top government officials; brakes on financing aircraft plant facilities; a measure of new plant expenditures for Curtiss-Wright Corp. postwar period 1945-1951, promoting the national defense interest through a fair rate of return, and measuring profitability of the aircraft industry.

Small Firms Get 3,461 AF Contracts

Dayton, O.—Small business will receive approximately $200 million in Air Force contracts by the end of fiscal 1952, according to a tabulation based on eight months of awards by Air Materiel Command.

Of 9,681 purchase requests screened to determine if they could be let to small business, 3,461 were found suitable for fabrication by smaller manufacturers.

The tabulation showed that 1,003 contracts totaling $119 million were awarded to 840 small business firms in 48 states. The report also indicated that 143 of these firms received contracts for the first time.

AMC officials point out that small business actually shares a much greater dollar volume through participation in subcontracting, not reflected in the above figures. It is estimated that approximately 70% of the Air Force dollar seeps into small business.

A Defense Appeal: Scrap for Steel

Trainer-X

- **USAF wants all-purpose training plane now.**
- **And later it will need Mach 1-plus trainers.**

By Ben S. Lee

Air Training Command, with an eye towards future supersonic operational flight, is moving rapidly to modernize the Air Force training program.

Two new types of aircraft are considered vitally necessary to close the rapidly widening gap between speeds and altitudes of present trainers and the production and near-production Mach 1 plus fighters and bombers.

The now internationally used North American T-6 "Texan" which has trained pilots since 1938 is rapidly growing obsolete despite a recent modernization program bringing the plane to "C" series. Its postwar replacement, the heavier T-28, although modern in most respects, is not considered wholly satisfactory by current air training command standards.

▶**Trainer-X**—First, Air Force wants a single trainer which can be utilized by Air Training Command to carry the fledgling pilot from first day primary to transition to specialized basic training from which he would graduate to advanced training.

Currently, primary training, although flexible, requires an average 360 hr. for completion. During this training the pilot trainee begins in a North American T-6G, switches to the T-28 and sometimes switches to a third plane before graduating into basic training and thence to advanced training.

During this program the trainee's learning curve rises and falls as he enters each new phase. The contemplated Trainer-X (AVIATION WEEK May 12, p. 15) would eliminate the so-called valleys in the learning curve which Air Force believes will result in a more economically though more thoroughly trained pilot. Further, Air Force believes primary training time would be reduced almost 100 hr.

▶**Two-Place Mach 1 Trainers**—Looking further into the future, Air Force is examining the possibility of two-place trainers capable of topping Mach 1. Need, of course, is to fill a requirement for pilot-trainees thoroughly indoctrinated in pilot techniques at speeds above the speed of sound.

In this connection Air Force said that present training transition of the pilot in which he has to go through the artificial barrier of sound alone, is difficult. Additionally, complex training procedures in connection with electronic gear and fire control equipment must be accomplished by the trainee alone.

Just what new jet types will be adapted to this purpose are as yet conjectural, Air Force says, although various data for a future competition are being gathered. For the interim period modification of some existing high speed jet fighter types to a two place configuration is imminent.

▶**All-Purpose Trainer**—Sought immediately by the training command is an all-purpose trainer combining the best features of both the T-6 and the T-28. Purpose of the design competition is to determine feasibility of a plane with side-by-side seating instead of in tandem that can cruise at 130 mph. below 10,000 ft. and at a minimum of 330 mph. above 30,000 ft., and includes complete control panel instrumentation simulating all conditions the trainee would have to cope with in advanced training, excepting fire control devices.

Air Force further stipulated that the plane would incorporate tricycle landing gear and that the craft should gross not more than 4,000 lb.

Air Force said it is looking toward the day that combat aircraft would require basic training aircraft to be capable of high subsonic speeds. AF considers the Trainer-X as the eventual prototype of such a craft.

Meanwhile, to modernize its training force and its technique, Air Force presently is evaluating side-by-side and tandem seating for modification of F-86 Sabres to basic training use.

▶**The Problem**—Need for dual control F-86 basic trainer types is to enable instructors to coach the trainee in high-speed techniques and maneuvers as well as "to hold his hand" the first time through the artificial sonic barrier. The two-place trainer will also give the trainee opportunity to learn more rapidly and more thoroughly through observation of actual combat tactics, etc.

Thus, when the trainee moves into advanced pilot training using supersonic interceptor and multi-engine bomber equipment, he will have been thoroughly indoctrinated through dual instruction in virtually all actual problems he will encounter in advanced training.

Meanwhile, design competition for Trainer-X has been delayed due to inability of Air Materiel Command to finalize specifications for engine categories around which the airframe will be evolved. Engine categories are expected to include jet, piston and turboprop. Further, Air Force sources state that AMC is contemplating some revision of cruising speeds at 10,000 ft. and above 30,000 ft. Tentative date for reissuance of specifications to the industry is set for June 16.

Air Force expects that it will have Trainer-X in operation late in 1954. So far prominent contenders for the TX contract are Beech, Temco, Fairchild, North American, Goodyear, Douglas, Cessna, Ryan, Convair, and East Coast Aeronautics.

Airspace Control Bill Introduced

Legislation giving the federal government exclusive jurisdiction over the continental airspace, including authority to condemn obstructions over 500 ft. tall, has been introduced by Sen. Edwin Johnson, chairman of the Senate Interstate and Foreign Commerce Committee.

Under the measure, the authority would be exercised by the Secretary of Commerce, who would probably delegate it to Civil Aeronautics Administration.

Air Transport Assn. has long favored such legislation, but it has never succeeded in hurdling the strong opposition of local and state governments. Now, in addition, there is the opposition of the television industry, launching a vast expansion of its TV tower system.

With control of the airspace would go control of all movements through it including intrastate operations. This is the nub of opposition by local and state aviation officials.

The bill directs the Secretary of Commerce to issue regulations regarding construction underlying paths of flight "where substantial air traffic exists or is reasonably anticipated" and adjacent to airports. The Secretary is authorized to acquire by purchase, lease or condemnation existing constructions considered flight hazards.

Senate Approves Ticket Agent Bill

Legislation giving Civil Aeronautics Board authority to clamp down on ticket agents for "unfair or deceptive practices or unfair methods of competition" has been passed by the Senate and now awaits action by the House Interstate and Foreign Commerce Committee.

Requested by CAB, the measure seems certain of enactment before the adjournment of this session of Congress.

In addition to giving the Board authority, after hearing, to require ticket agents to desist from unfair competitive methods, the legislation also sets a fine of not less than $100 and not more than $5,000 for each rebate "or other concession" made in connection with ticket sales.

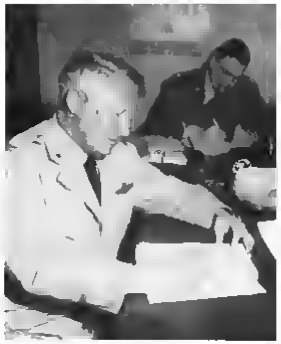
COL. CHARLES A. LINDBERGH, 50, with Lt. Gen. J. K. Cannon at a recent USAF exercise in Germany. Lindbergh lives with his wife and five children in New England. He is an unofficial and unpaid USAF advisor.

REAR ADM. RICHARD E. BYRD studies a globe at his Boston home. Byrd is a Navy consultant on arctic and polar projects.

CLARENCE D. CHAMBERLAIN, 58, poses in one of the German Porsche sports cars he sells in Bridgeport, Conn. He also operates a dairy farm.

RUTH FLDER, "The American Girl," is now a Hollywood, Calif., housewife. Scrapbooks recall her flights.

GEORGE W. HALDEMAN today is chief, aircraft engineering division, CAA, Washington.



COL. BERNT BALCHEN is shown sitting at his Pentagon desk. He is U. S. Air Force arctic expert.

Salute to 1927 Heroes

Twenty-five years ago the flyers pictured on this page captured the world's headlines and helped make 1927 one of aviation's golden years. Here are some of their 1927 exploits:

- Lindbergh flew first solo across the Atlantic, New York-Paris, May 20-21, in Ryan monoplane, Spirit of St. Louis.
- Byrd attempted New York-Paris flight June 29 with Bert Acosta, Bernt Balchen and George Noville in Fokker trimotor America, crashed in surf near France.
- Chamberlain flew New York-Eisleben, Germany, June 4 with Charles Levine in Wright Bellanca Columbia monoplane.
- Lider and Haldeman took off from New York Oct. 11 in a Stinson for Paris, force-landed 360 mi. from The Azores.

Safer Air Travel Outlook Bright

Guggenheim Center says greatest need today is large investments in ground facilities, airline equipment.

An exhaustive analysis of current aviation safety research indicates much recent progress and justifies an optimistic view for safer air travel of tomorrow, the Guggenheim Aviation Safety Center has announced.

The study shows that the U.S., Canada and Great Britain together are conducting approximately 900 individual research projects costing more than $50 million annually to promote aviation safety. As a result, the number of air accidents has been reduced to about half what it was five years ago, but fatalities per passenger mile continue about the same because today's larger planes carry more passengers.

However, huge additional capital investments in safety by airlines, federal governments and municipalities are called for to take advantage of the greater safety offered by new technical developments, Harry F. Guggenheim, chairman of the Foundation Committee of the Center announced.

▶ **Investment Needed**—"The huge recent increase in commercial flying operations has taken place without adequate increase in invested capital. Our commercial air transport as a whole is operating on meager resources, and neither the government nor the airlines have been willing to face the facts. Commercial aviation is like a small boy who has outgrown his clothes. Traffic has far outstripped airborne equipment and ground facilities. Until these have been adequately provided, far stricter government regulation must be imposed," the Foundation chairman said.

Commercial airlines need to spend about half a billion dollars additional on equipment and other hundreds of millions must be invested by federal governments and municipalities to provide adequate ground facilities, Guggenheim declared.

▶ **Accident Analysis**—Analysis showed that the 1951 scheduled domestic air transport accident rate per million passenger miles was 1.3, compared with 1.1 in 1950 and 1.9 for an average of the three preceding years. The rate is about three times that shown for railroad passenger trains, .45 for 1951.

Non-scheduled transport operators for 1950, last available year, showed an accident rate of 3.7. Personal flying showed a decrease in number of accidents and number of fatalities, from 1949 to 1950, but the personal flying accident rate is still "appalling," the report states, and "susceptible of enormous improvement."

▶ **New Projects**—Since the Guggenheim Center's first report on aviation safety research shortly after its organization a year ago (AVIATION WEEK Apr. 2, 1951, p. 15), some 274 additional safety research projects have been added to the 600 projects listed last year as contributions of 90 separate agencies, universities and the aircraft industry.

Research progress in the last year has filled many of the "gaps" in research noted in the first report and additional work is being undertaken in many of the weaker areas.

Here are samples of some of the advancements in safety work cited:

• Increased use of flight simulators for better training of crew coordination and emergency procedures. Recommendation is made for rental agreements to make simulators for new types of planes more readily available to airlines.

• Functionalized cockpit control grouping in most efficient locations, based on studies of human capacities and reactions instead of standardized controls.

• Continuing studies of tolerance to altitude, acceleration and fatigue.

• Better testing of accessories to im-

NEWS Edo NOTES

Grumman SA-16's Save Nearly Two Hundred Airmen

Rescues of downed U.N. airmen afloat in the water off Korea are becoming so common that they hardly rate more than a paragraph in the daily wire dispatches from the Far East theater. The seemingly routine nature of these pick-ups belie the rugged conditions under which members of the Air Rescue Service have to operate and the terrific beating which their Grumman SA-16 Albatross amphibians take so well in landing out in open water to snatch pilots and airmen from their watery roosts. Over 170 crewmen have been rescued so far.

Contributing to the rugged sea-going characteristics of the SA-16 are the wing tip floats built by Edo which not only provide buoyancy in the water, but also carry several hundred gallons of fuel to give the Albatross long range for extended missions. The floats also serve as attaching points for the ski gear when the SA-16, in amphibious configuration, lands on ice or snow.

Few aircraft components must take the bearing which floats must endure—especially the wing tip floats of a plane such as the SA-16, which is bigger than a DC-3, in an open water landing.

These floats must not only withstand damage but they must remain tight to keep the water out—and the fuel in. Because Edo has specialized for 27 years in the construction of all-aluminum floats, where precision and good workmanship are so important, the industry turns naturally to Edo both for design and volume production of highly intricate all aluminum components.

Edo CORPORATION
Since 1925 COLLEGE POINT, NEW YORK

prove reliability. Improved statistical analysis of accident probabilities and prevention.

- Prescription of these safe design principles by the center to be followed by engineers. Design components to fail with safety, to resist rough handling, impact, icing, etc., procedures for maintenance and operation should be established consistent with average human ability effort and attitudes; design to protect the aircraft and components against normal human error and carelessness, and to protect occupants in accidents considered survivable.
- Anti-collision flasher and radar equipment.
- Automatic flight recorder developments, not yet adopted by U.S. airlines pending further refinements and pilot acceptance.
- Convertible aircraft developments, sponsored by Army and Air Force, and boundary layer control developments sponsored by NACA, to improve approach and landing characteristics and reduce accidents in this area of flight.
- Setting up a program of instrumented crash landings to be conducted this year by NACA.
- Passenger protection and plane evacuation studies.
- Improvements in structures materials and aerodynamic design tending to make aircraft safer in many ways.
- Airport visibility studies.
- Upper atmosphere weather studies of gusts, turbulence, jet streams, etc.
- Development of improved model survival and rescue equipment.

Australia Seeks Air Base Equipment

(McGraw-Hill World News)

Melbourne—Approval to purchase substantial quantities of foreign-made equipment vitally needed in air base construction and expansion has been granted by the Australian Government, with early orders sought.

Orders have already been granted for 12 Lockheed P2V-5 Neptunes, and a like number of D.H. Vampire T. Mk. 11 two seat trainers. Expected are some English Electric Canberra jet bombers to fill the gap until Australia gets the plane in production. An undisclosed number of Gloster Meteor fighters are also due.

The RAAF has placed orders for local manufacture of 80 D.H. Vampire fighters, 48 Canberras, 72 North American-designed Sabres (with British engines), 24 Vampire trainers and 62 basic trainers of new design (possibly the Commonwealth CA 22).

Get in the Scrap—Turn Yours in for Defense

Skyrocket Study Yields Highspeed Data

- **Pilot Bridgeman's test flights described.**
- **Transonic speed's effect on subsonic wing told.**

Today's transonic combat speeds were yesterday the exclusive property of research aircraft such as the Bell X-1 or the Douglas D 558-II Skyrocket. With supersonic fighting speeds only a stone's throw away, the experience and data gained during highspeed flight tests with research craft may point the way towards easier attainment of superspeeds.

Current holder of the altitude and speed records for research craft in the United States is the Douglas Skyrocket, with William B. Bridgeman up. The craft has been flying for four years, gathering highspeed flight data over a wide range of altitudes and speeds.

That flight experience is worth a close look.

▶**Description**—Actually Bridgeman calls the Skyrocket an obsolete aircraft, designed from a sister ship to the Douglas Skystreak when the advantages of sweepback were recognized. A supplementary rocket engine was included in the basic modification, which turned out—as modifications usually do—to be a complete redesign.

Airfoil sections are of conventional subsonic type, with rounded leading edges. Prime purpose of the Skyrocket flights was to explore the characteristics of this kind of wing at high speed.

Control surfaces are simple, with no aerodynamic balancing or hydraulic boost. Wings are swept 35 deg., are 10% thick and have a 3.57 aspect ratio.

High speeds were incidental to the main research body of the flights. Aerodynamic design information was the primary goal—drag, maximum lift, stall characteristics, buffet boundaries and stability and control trends. Greatest value lay in the comparison between full scale flights and windtunnel test data. Reynolds' numbers from 5 to 50 million were reached during flights, as well as life and drag variations with Mach number at constant Reynolds' number.

▶**Temperature Studies**—Much effort went toward the measurement of temperature rise with Mach number. The aircraft skin and windshields were instrumented. Bridgeman says that about 270F rise was experienced due to skin friction, but that the structure absorbed at least half of this and he was never conscious of the heat.

A photopanel recorded all flight instrument readings. Automatically reading manometer system took 400 pressure measurements on wing and tail surfaces. Control forces and stresses in the structure were measured by means of 904 electric strain gages and recorded on an oscillograph.

▶**Normal Takeoff**—In the early phases of the Skyrocket program, takeoffs were made in normal manner from the ground. Bridgeman regarded these as "most hazardous" because they were made with full rocket fuel load.

Takeoff technique began with normal starting of the turbojet engine, then priming of the rocket powerplant. After priming, which takes about 70 sec., brakes were held for 10 sec. while the turbojet was brought up to full power.

Takeoff ground roll began under turbojet thrust alone and stayed that way for 60 sec., at which time Skyrocket was blasting along the runway at about 100 mph. On the one-minute mark, the pilot hit the rockets and began actual takeoff. Two cylinders of the rocket powerplant were needed to break ground, one will just about do it.

SKYROCKET snuggles under belly of mother ship, Navy P2B 1S, before air launch

"From 100 to 190 mph. is just a click of the fingers," said Bridgeman. (Once he held the Skyrocket on the ground to 210 mph., threw all the rubber off the tires and took off on the nylon casing.)

Climb was made with rocket plus turbojet power after takeoff, but there were disadvantages. One of these was that Bridgeman had to keep an eye on the turbojet instrumentation when he should have been free to watch other indications. And the second was that the climb speed was high enough to windmill the turbojet to 17,000 rpm. when its maximum power rpm. was only 11,500.

It took four tries to get an optimum climb in this configuration without exceeding the critical Mach number of the airplane.

The climb was planned so that about 50 gal. of turbojet fuel would be left for the trip back home after the test runs.

▶**Air Launching**—As the program progressed, everybody realized that the long climb to altitude was penalizing the Skyrocket performance. So one of the Skyrockets was converted for pure rocket power and air launching. To do this, the turbojet engine was replaced with additional rocket propellants.

Mother aircraft for the drops was a

converted Navy Boeing P2B-1S (USAF B-29) with some rework on the aft fuselage around a cutout for the Skyrocket's tail.

The performance of the research craft following the air drop is dependent to a large extent on the mechanics of that drop.

The mother ship set the course at release time, and drop took place close enough in so that a dead-stick landing could be made on the runway if the rocket failed to function.

Two chase pilots worked with the speed runs. The first flew formation during the drop and checked the firing of all four cylinders of the rocket motor. The second waited at the terminus of the speed run (about 100 mi. away and as high as he could get) and intercepted the Skyrocket in its turning descent on the way back. This second chase pilot was expected to act as a guide back to landing if, for example, the windshield of the Skyrocket iced over. And he also read off the airspeed to the Skyrocket during final approach and touch down.

Release of the research craft was controlled by the pilot of the mother ship. It was his responsibility to arrive at the exact launch position at proper altitude and speed.

▶**Skyrocket Flight**—Here is a typical drop: Before the drop, the Skyrocket pilot gets aboard. The chase pilot formates on the starboard side of the mother ship. The rocket powerplant and then the cabin of the research job is pressurized. The pilot turns on the photopanel.

Right after the drop is made, the first cylinder is fired, followed by the other three in order. The Skyrocket has to be climbed as soon as possible to avoid exceeding critical Mach number, but it takes about 10 sec. before full thrust is available from the engine.

That means there is the possibility of an accelerated stall before climb conditions are stabilized.

Bridgeman also found that he could never pull more than about 1.6 G before the aircraft began to buffet severely. His best stall-warning device was the needle-nose of the Skyrocket. This boom, which is about all the pilot can see of the airplane, vibrated violently as load was applied, and Bridgeman had it calibrated mentally as a stall warning.

▶**Climb and Pushover**—The Douglas aerodynamicists were never satisfied with the way Bridgeman made the climb with the Skyrocket. Some speed was passed about 8,000 ft. too low and airspeed led the programmed speed by at least 0.05 Mach.

But there were things which complicated the climb, said Bridgeman. At the rate of fuel consumption—close to one ton per minute—wing loading of the craft changes rapidly. So does the angle of attack. Finally the indicated

airspeed drops so low that the craft must be allowed to reach supersonic true airspeed in climb. When this happens the elevator—which is a conventional subsonic surface—becomes ineffective. Horizontal control of the rest of the flight depends on the use of the controllable stabilizer. This is done with a trim control and does not, of course, operate from the stick.

Pushover at the top of the climb could be controlled adequately and smoothly by changing the trim of the stabilizer. There were no longitudinal problems in the speed runs, but after fuel exhaustion it was necessary to turn 180 deg. to return to base. These turns were started at the highest Mach number reached during the speed runs and were, as Bridgeman said, "... very difficult and very educational." (Turning flight will be discussed in detail later in this article.)

▶**Return and Landing**—After the turn had been made toward base, the chase pilot would perform the intercept and then fly formation on the Skyrocket. Another job of the chase pilot was to check the landing gear position of the Skyrocket during the flight back.

Best lift-drag ratio for glide back was found to be at 300 mph. (presumably indicated airspeed). Pattern for return to base was downwind at 15,000 ft and 300 mph. with turn into base leg at 8,000 or 9,000 ft. Final approach began at 7,000 ft.

Bridgeman planned his landings for about one mile down the runway, to have about eight miles left to stop the roll. Touchdown came at about 180 mph.

▶**Flight Test Program**—One of the most unusual phenomena discovered during the test program of the Skyrocket was the development of lateral oscillations. These oscillations started after the first air launching, and appeared on each successive flight. What was done by Bridgeman and the flight test people to attempt to correct these oscillations makes fascinating reading.

▶**First Flight**—Climb Mach number reached 0.92 on the first flight. As the climb passed 30,000 ft., the oscillations became perceptible. The wing dipped about 4 deg. from horizontal at a rate of about 5 deg. per second. (This wing heaviness at transonic speed has been reported for aircraft other than the Skyrocket.)

A little later in the climb, rudder oscillations began. The rudder moved about 3 deg. each side of center at about 3 deg. per second. Movement could be stopped by applying rudder pedal force. The lateral oscillations could also be stopped by rudder control, deflecting against the roll. The rudder was found to be much more effective than aileron control.

Pushover at the top of the climb was made gently at about 0.7G and peak altitude was about 41,000 ft.

▶**Second Flight**—Pushover was made at 0.7 G at 47,000 ft. The Skyrocket began to roll during the pushover, and ailerons were ineffective to dampen the motion. Force feedback on the rudder pedals was so strong that Bridgeman had to give up thoughts of controlling the plane by those means.

As the craft accelerated, the roll got more violent, and finally Bridgeman cut the rocket engine. At maximum Mach number, wing roll was about plus and minus 10 deg., accompanied by about one degree of yaw on each side and forcible rudder travel about 3 deg. each side of neutral. Rate of roll was about 15 deg. per second.

Analysis of this flight and the test

VENERABLE HELICOPTER TEST RIG

This ancient White truck is being used as a static helicopter test bed by the Piasecki Helicopter Corp., Morton, Pa. Truck body was extended with a welded assembly and the rotor assembly was mounted over the cab. A 600 hp. aircraft engine drives the rotor through its regular gearbox. This rig has racked up over 1,800 hr. in tests.

data suggested locking the rudder for succeeding flights. This was done with a plunger which could be withdrawn to free the rudder for landing. Bridgeman says that the rudder lock wasn't expected to be a cure-all, but was intended only to provide enough control to continue the tests.

▶ **Third Flight**—Following the installation of the rudder lock, it was found that lateral oscillation still existed, but that aileron effectiveness had returned. This meant controlled flight, and the Mach number on this flight was increased. The roll was more sluggish, said Bridgeman, and opposite aileron could be applied to dampen the action.

The postflight data showed that only one-quarter as much aileron force was needed with rudder locked and that sideslip angles had been cut to less than half a degree. Rate of roll was down to about 7 deg. per second, and the craft rolled only about plus and minus 3 deg. In spite of the lock, the rudder was floating about one-tenth of a degree.

▶ **Fifth Flight**—On the fifth launch the pushover technique was changed. The G loading was dropped from about 0.7 to 0.25 to find more acceleration after the climb. The result of this flight, Bridgeman understates, ". . . was the most interesting of any we encountered."

The Skyrocket began violent rolling as the low load factor was applied. The wings dropped as much as 75 deg. on a side at the rate of 86 deg. per second. Sideslip angles peaked at 6½ deg. These oscillations were occurring near the peak maximum Mach number of the craft.

As much as 65-lb. stick force was used on the ailerons trying to combat lateral motion, effectiveness was so low that Bridgeman felt it would be useless to try any higher force. And it was extremely difficult to remain out of phase with the roll, so that aileron motion might aggravate disturbance.

Finally the flight became so rough that the rockets were cut; but the oscillations continued and became even more violent for a while. The alternate rolling made it impossible to hold the turn in a steady bank to enter the turn to base. Bridgeman finally applied a longitudinal load of about 4G in "[illegible] the opposite direction . . ." (presumably positive G or a pullup) and the oscillations were damped out enough to make a successful 180-deg. turn.

Reduction of the data showed that at times the rudder hinge moment was as high as 750 in.-lb., corresponding to 80 lb. pedal force.

▶ **Sixth Flight**—In this test—considered by Bridgeman to be the best of the series—the climb angle of attack was increased as rapidly as the buffet at stall warning would allow. Once when the

boundary was penetrated, the right wing dipped sharply in a partial stall. Momentarily lowering the plane's nose regained control.

Near the top of the climb there was a small amount of lateral oscillation. The pushover was entered with 0.8G, control was still available, so this was reduced to 0.6G. At this point the left wing got very heavy and could not be picked up with ailerons. So the load factor was increased to 0.8G. This returned lateral control and the load factor was again dropped to 0.6. In a few seconds the propellants ran out and the flight was terminated.

▶ **Turning Flight**—One of the most unusual experiences of the flight series must have been the turn after speed runs. Bridgeman says that going into a vertical bank and applying full up elevator would not change the aircraft course by one degree. But by using stabilizer trim change of about three or four degrees, and in some cases all that was available, the load factor could be brought to 4G. Then the craft could be put into a diving turn for the trip back to base.

An undesirable feature of this trim control was that it was mandatory to return the stabilizer to neutral position right after the turn started. Electrical activation of the control is slow because of the high air loads on the stabilizer, and to keep the plane from stalling the load factor has to be relieved almost as soon as it is applied.

In one case, the angle of attack reached 18 deg. at the beginning of a turn. The airspeed was supersonic, but the indicated speed was low. Before the trim could be brought to zero, the aircraft pitched forcefully several times about the lateral axis and nearly stalled before anything could be done. The aerodynamic influence in this turn came from the speed reduction to subsonic. Center of pressure then moved forward about 10 or 15% which accelerated the turn by an additional G and

"Like me to do a loop again, old man?"

Hawker Siddeley Review

helped aggravate the near stall.

▶ **Air Launching**—Bridgeman is on the record in favor of the air launch technique, and of rocket powerplants. He has high praise for the Reaction Motors, Inc., four-cylinder rocket engine—once ignited it never failed, he says.

And as for air launch, it "is wonderful, you just drop off into space—you are already flying after a fashion—you light off the tubes, burn off your volatile chemicals, jettison anything you have left and slide in empty."

Bridgeman wants a "genuinely supersonic" airplane which would stay at peak Mach numbers for minutes instead of seconds, and which would have proper controls, wings and air conditioning. Such a research craft would investigate aerodynamic heating, controls, materials and systems. Could this be a sneak preview of the Douglas X-3?

—DAA

THRUST & DRAG

The raucous clatter of a Wright Whirlwind J-5 broke the quiet of early morning on May 20, 1927, at Roosevelt Field. Blue exhaust glinted off the polished metal cowling of a silver Ryan monoplane with "Spirit of St. Louis" emblazoned on the nose. Inside Charles A. Lindbergh made his final check before takeoff.

At 7:52 he opened the throttle, pounded down the field and cleared the runway to start the greatest adventure aviation had to offer 25 years ago.

His airplane had been built in 60 days for a cost of about $12,500, including design. Lindbergh and eight St. Louis businessmen had financed the project. The plane grossed about 5,000 lb., and had a 46-ft. wingspan. Wing chord was constant at 7 ft. Power came from a J-5 which developed about 220 hp. for takeoff.

Lindbergh's plane was basically a modification of the Ryan M-1 mail and passenger plane. The Spirit of St. Louis had a lengthened fuselage and was cleaned up considerably from the M-1. Structure was simple. Welded steel tubing for the fuselage, laminated spruce spars and built-up spruce and plywood ribs for the wing.

Visibility for Lindbergh was of a low order, he used a periscope to see forward, and had two side windows and a roof window. He was almost surrounded with gasoline: there were two tanks in tandem between him and the engine, the wing center section held a single tank and the outer panels each had one, total fuel load was about 450 gal.

Wing loading of the NX-211 was about 15 psf., and power loading was

about 22 lb per hp Wide open, the craft would touch 125 mph

Today Roosevelt Field echoes to the roar of Diesels and the tearing sounds of earth-moving But 25 years ago it was the birthplace of all Atlantic flights; since, of the myriad daily crossings of Constellations, DC-6s, Stratocruisers. Twenty-five years ago America got its first air hero of epic stature.

* * *

A new vibration damper for copter control sticks is being installed on production Hiller *H 23* and *HTE* rotary-wing craft Hiller says that it eliminates "practically all the vibration" and that it provides smoothness of control comparable to that of a fixed wing aircraft It's been tested operationally and found satisfactory. Hiller expects to produce kits for the fix to be made by field mechanics on copters which have been delivered Now all that remains is to eliminate the original source of vibration which will eliminate the need for an additional gadget to stop the stick shake

* * *

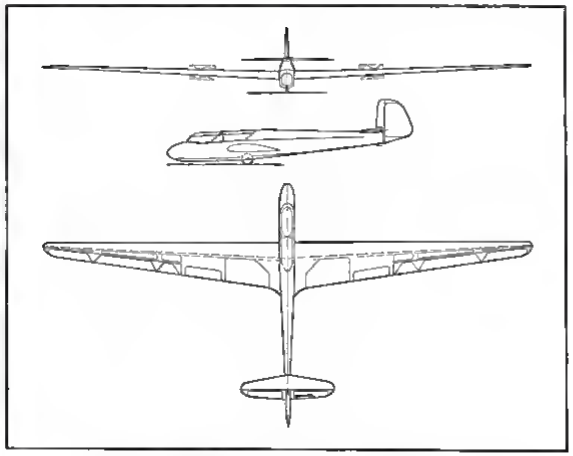
What we really ought to be worrying about is a Model T spaceship, instead of a space hotel, says James H Wyld, one of the original founders of Reaction Motors, Inc, and the first American to build the now-standard regenerative rocket motor

Wyld says that Columbus didn't wait for the construction of the Queen Elizabeth before setting out on his voyage. And he backs up his statements with some calculations for a simple, light spaceship to carry two small men for a couple of days aloft.

Creature comfort is minimized—I'd call it non-existent—in the three-stage vehicle. Its dimensions are estimated at slightly larger than the V-2 (which was 45 ft long and 5 4 ft in diameter) Gasoline and liquid oxygen would be the propellants

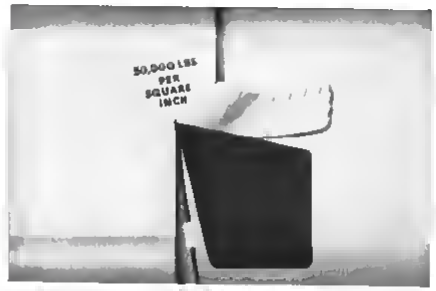
The secret of the amazing performance increase over the V 2 would lie in the use of special materials, three-stage construction, increased motor efficiency and reduced payload. Wyld estimates the loaded weight as 12 7 tons, empty weight 1 4 tons, reduced later to half a ton by jettisoning tanks and motions

This sounds like the opening gun in the battle between the proponents of the "grand scale" projects as envisioned in Collier's recent Space Flight issue, and the "first things first" school of Wyld and others Regardless of the outcome of the battle, it underscores the fact that the field of space travel has not yet fallen into a single groove of patterned thinking. —DAA



FOCKE-WULF OFFERS 2-PLACE GLIDER

Focke-Wulf GmbH, Bremen, World War II builder of the FW 190, considered by many to have been the top piston-engine fighter used by the Luftwaffe, is back in business again—with a two-place glider named the Kranich III The dual-purpose trainer and high performance glider was scheduled to finish its flight tests and be placed on the market this month. Construction is conventional fuselage is steel tubing covered with fabric, wings are of wood, as are the control surfaces. The Kranich III spans 60 2 ft., fuselage length is 29 78 ft, wing area including ailerons totals 217 35 sq. ft. Weight empty is about 500 lb, gross, 950 lb. Sinking speed is 125-9 ft./min.



HI JET'S OIL STREAM hits high pressure contact point between work and tool, lubricates and cools as shown in this ...

MAGNIFIED DRAWING illustrating how oil vaporizes at the hot tool tip, passing under chip finally to condense (black).

Oil Jet Hits Spot, Stretches Tool Life

- **Gulf system shoots the lubricant up at work.**
- **So chips cannot hinder action at contact point.**

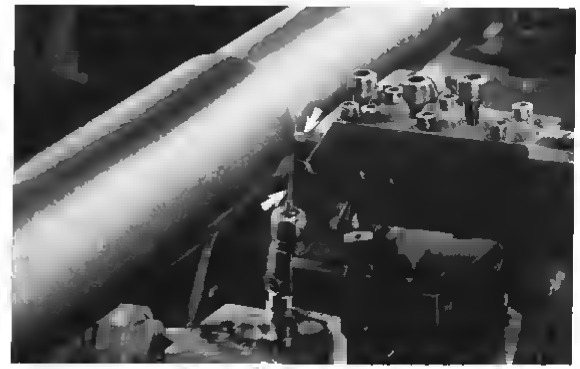
Research to boost the efficiency of machining has come up with an answer that promises big dividends for the metal-cutting industry.

Makers of aircraft, engines, accessories and parts, who process innumerable machined items, should benefit greatly by this new approach. It offers greater productivity and lower tool and finishing costs.

The new development is known as Hi Jet. It was devised by R. J. S. Pigott, director of engineering and research, Gulf Research & Development Co. It is a simple but radical method for lubricating and cooling metal cutting tools—long a problem in the field of machining.

►**Up, Not Down**—Pigott's plan reverses the general procedure wherein cutting oil floods the tool and workpiece from above. In this conventional approach, the chip tends to prevent a sufficient volume of oil from reaching the point where the cutting edge meets the workpiece.

Pigott's scheme is to use small jets positioned beneath the tool-workpiece contact point. In this way, fine streams of cutting oil are pinpointed, without obstruction, directly onto the machining point—right where the oil is needed. The result is a new efficiency in lubrication, coupled with improved heat transfer.

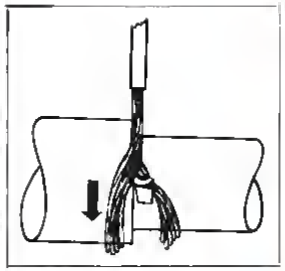


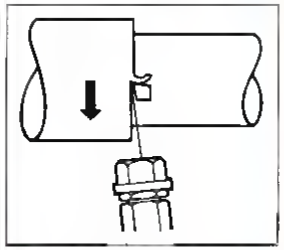
LATHE SETUP demonstrating how Hi Jet is applied. Multiple nozzle below work shoots high-speed stream of oil (lower arrow) at cutting edge of tool (top arrow).

STEEL	CUTTING CONDITIONS	TOOL		TOOL LIFE			
				Overhead Flood		Hi-Jet	
		Material	Shape	Oil	Time, Minutes	Oil	Time, Minutes
SAE 9120	110 sfm 0.011 in. feed 0.180 in. depth of cut	M-4-1 High-speed Steel	8-12-2-10- 6-6-14	Mineral Lard Sulphurized Mineral	17.02 12.68	Gulf Hi-Jet 08	177
AISI 8748	140 sfm 0.011 in. feed 0.130 in. depth of cut	M-4-1 High-speed Steel	10-13-5-10- 6-6-14	Sulphurized Mineral Sulphurized Lard-Sulphurized Mineral Sulphurized Lard Mineral-Lard	9.3 84.0 16.8 23.0	Gulf Hi-Jet 08	839.5
SAE 1095	812 sfm 0.008 in. feed 0.125 in. depth of cut	M-4-1 High-speed Steel	8-8-8-8 6-3-16	Soluble	1.27	Gulf Hi-Jet 08	19.8
AISI 416 Stainless	160 sfm 0.011 in. feed 0.150 in. depth of cut	M-4-1 High-speed Steel	10-16-9-10- 9-6-14	Mineral	9.4	Gulf Hi-Jet 08	163.8

IMPROVED TOOL LIFE is indicated in these test results obtained at Gulf Research & Development Co., for comparison of overhead flood procedure vs. Hi-Jet.

Translated into practical machining benefits, it means that the operator can run his machine at conventional speeds with greatly extended tool life, or he can push up his operational speed with no reduction in the life of the cutting tool. Gulf reports that at normal cutting speeds life of high-speed tools has





Overhead flood (top picture) is impeded by chip, jet (below) hits tool contact point.

been boosted six to 12 times (even greater boosts are possible at higher speeds). With carbide tools, an increased life of at least 3 to 5 times has been obtained. Tied in with the scheme is Gulf's Hi-Jet oil, a new lube selected after extensive research with the spray system.

▶**How It Developed**—The idea for Pigott's system started when he checked the results of some machining tests using overhead flooding. As the workpiece came away from the cutting tool, he noticed that the work surface was dry and shiny. That meant the flood of cutting oil wasn't hitting the right spots, so Pigott literally turned things upside down by shooting the oil up to the tool edge for better lubrication and cooling.

The idea was so simple that many an engineer scratched his head and said, "Why didn't I think of it?" The answer to this query, equally simple, was aptly summed up by automotive engineering pioneer Charles Kettering, who said "It's the obscurity of the obvious."

Once Pigott hit on the idea, the new system was extensively tested in a variety of runs with metals ranging from SAE 1020 carbon steel to the new "wonder metal" titanium, to prove the advantages of the up-jet procedure.

One example reported to illustrate the efficiency of the new method is on the machining of valve stems. Before Hi-Jet was installed on the lathes, oper-

ators had to change tools after turning out about 50 of the units. With the jet system's improved lubrication and cooling, cutting tools averaged 275 valve stems before they had to be replaced. This meant an estimated saving of about $1,200 annually per lathe.

▶**How It Works**—Here's how Hi-Jet imparts its lubrication and cooling:

Where the tool and the work are in intimate contact there may be a pressure of 50,000 psi or more, while Hi-Jet's pressure is only a few hundred pounds per square inch. But this doesn't prevent the oil jet from coating the spots that need lubrication and cooling, because there are slight irregularities in both the cutting edge and the work surface that form tiny openings.

Even though the jet pressure can't force liquid oil through, the edge temperatures are well above the oil's boiling point. As the oil hits the edge of the tool a lot of it flashes into vapor and is forced through the minute spaces between the tool and the work.

In the process of vaporization, considerable heat is picked up from the cutting edge. Once past the cutting edge, the trapped vapor condenses on the cooler chip and the tool shank and gives off the heat picked up at the cutting edge. There's another way that heat is removed—by an excess flow of liquid oil outward along the underside of the cutting edge.

There's ample evidence that oil is caught between the chip and the tool for an efficient lubrication job. Gulf says:

- **Chips are coated with oil** as they leave the contact area.
- **There's no tool buildup** (particles of metal from the work which are welded on to the cutting edge as a result of heat generated).
- **Tool nose wear is reduced.**
- **Chip crater is more uniform.**

Test results have shown a reduction in surface roughness from 200 to 60 microinches, says Gulf. Greater dimensional accuracy is another benefit.

In the vaporization process, considerable smoke is generated, but quenchers have been developed to cope with this situation. One of these schemes uses shower heads which pass oil from the machine's conventional overhead flood equipment to set up a flow curtain that blankets and condenses the vapor formed.

▶**Other Benefits**—In addition to the direct cooling and lubricating advantages, Gulf says that as a result of increased tool life, the setup and grinding time can be reduced on many jobs. Longer tool life also means that fewer tools will be required—and this can mean a real saving on large production jobs.

Widest application for Hi-Jet, says

Gulf, initially will be on turning operations, because the system can be more easily applied to lathe tools. But with proper nozzle designs and attaching fixtures, Hi-Jet is seen practical for many other machining operations.

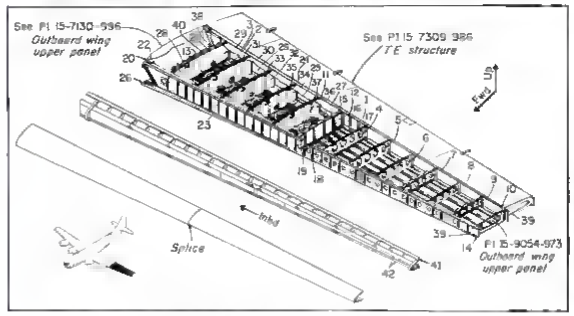
It is reported applicable for use on most other single-point or form tools, milling machines, gear cutters, chucking machines, multiple spindle automatics, some grinding machines, external broaches and certain types of drills. Special nozzles, deflecting devices, mounting attachments and valve arrangements are already being designed for many of these units.

▶ **Available Soon**—Components of the Hi-Jet system are a motor-driven pump, filter, pressure regulating valve, jet nozzle and holder, and low-pressure coolant spray. Hi-Jet's suction side is connected to the existing coolant system. The discharge end is connected by flexible hose to the jet nozzle.

First Hi-Jet production units are slated for delivery early in July. Thompson Products, Inc., Cleveland, at whose plant much of the development work was conducted under production conditions, will manufacture them under license from Gulf Research & Development Co. Both Thompson and Gulf's industrial marketing organization will participate in the distribution of the units. —IS

Copter Plant Expands

Piasecki Helicopter Corp., Morton, Pa., has started operations in its new 220,000-sq. ft. plant following moving of HUP and H-21 assembly lines into the building. Company now has more than 500,000 sq. ft. in the main plant and in satellite locations. Piasecki has awarded Burton Rodgers, Cincinnati, a contract for a number of HUP maintenance trainers.



SKETCHES SPEED PRODUCTION

Boeing Airplane Co., Seattle, is making liberal use of simplified production sketches detailing airplane assemblies to aid production employes in assembling components of large bombers and freighters. The sketches eliminate need for hundreds of individual blueprints formerly used, save much study time on individual operations. Sample sketch above represents Boeing C-97 component depicted in photo, clearly marks assembly steps. Similar system was used by company in World War II to speed B-17 and B-29 output. Most of the production illustrations are made on scale of 1:10.

ROLLS on new stretch flattening machine accommodate extruded skin with smooth top surface and its underside carrying T shaped integral stiffeners (arrow). Rolls tension sheet just beyond yield point, then end clamping jaws provide pull to stabilize sheet for permanent flattening

Integral-Stiffened Sheets Flattened

A new process has been devised for getting the required flatness in extruded skin with integral stiffeners.

Longren Aircraft Co., Torrance, Calif., has a machine that is reported to stretch-flatten the sheet on a volume basis, well within the flatness tolerances required.

Details of this type of skin and its potential for aircraft wings and fuselages originally were described in AVIATION WEEK Apr. 24, 1950, p. 15. The sheet is extruded in tubular sections with integral stiffeners radiating from the outside of the tube. For use as skin, these tubular sections have to be split and flattened. But because of internal stresses in the extruded section, flatness control has been a troublesome factor in adapting the sheet for structures in high-speed planes.

▶ **Initial Tensioning**—First, the aluminum alloy tubular sections are split longitudinally, then roughly flattened and heat treated. For the initial stretch, the heat-treated sheet is end mounted in a tensioning machine with one V clamp fixed, while the other is moved by a hydraulic piston. In this setup, the sheet is tensioned to a value which is just below the yield strength of the material.

For the final flattening step, the machine employs a traveling carriage incorporating three displacement rolls. The two lower rolls are recessed so that the tops of the extruded stiffeners in the sheet rest firmly against the bottom of the recesses, while the top surfaces

of the rolls contact the sheet area between the stiffeners. The single upper roll, centered over the two lower ones, presses against the external, flat side of the extruded sheet.

► **Yield Point Control**—With the movable clamp automatically maintaining even tension the traveling carriage progresses along the sheet from the end held in the fixed clamp. After the sheet contacts the first lower roll it angles down under the single upper roll, then angles up again to the second lower roll from which it reverts to the plane of tension between the clamping jaws. In this operation, the greatest elongation occurs as the material passes under the center roll. Here, the sheet is tensioned slightly beyond its yield point and work hardening takes places. As the sheet passes the last displacement roll the material stabilizes to a permanently flattened condition.

After this flattening operation, the sheets may be contoured, as required, with conventional stretch presses.

PRODUCTION BRIEFING

Bristol Aeroplane Engines (Eastern) Ltd, Montreal, this year plans to build a $2-million plant for engine overhaul and repair work. Firm has a $12-million engine overhaul and repair contract from RCAF.

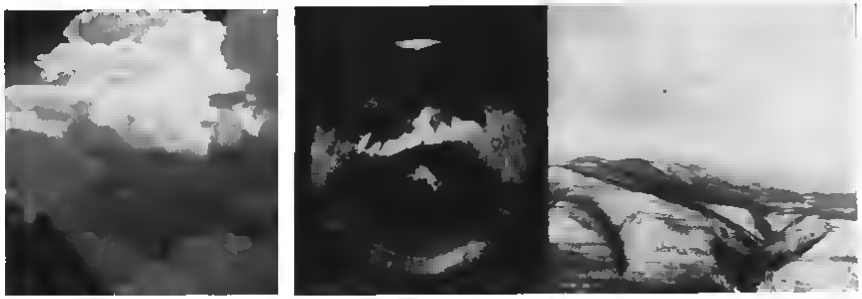
Douglas Aircraft Co, El Segundo, Calif., has signed a contract with Navy to rehabilitate the World War II aluminum plant in Torrance, Calif., for use as an aircraft parts fabrication facility. Property contains approximately 1 million sq. ft. of buildings.

General Dynamics Corp. is now official corporate name for Electric Boat Co., producer of aircraft, submarines and motors and generators.

Grand Central Aircraft Co., Tucson, Ariz., has started construction of a new 23,600 sq. ft. electronics building and an additional flight ramp to cost $1,250,000 as part of the $5 million improvement program being handled by the firm at Tucson.

Goodyear Aircraft Corp., Akron, Ohio, expects to have its new facility for production of rocket components completed this summer.

Jack & Heintz, Inc., Cleveland, has named Aircraft Appliances & Equipment Ltd., Toronto, Ont., Canadian distributor for its entire line of rotomotive equipment. The distributor has increased its facilities and its quarters at 71 Kipling Ave., South, West Toronto, to handle the new contract.



SPOTTING DANGEROUS storms and terrain is radar's biggest use in airline operations, some transport experts feel. That's why

ATA Seeks Radar With Fewer Frills

Airlines feel that better terrain and weather warning are essential, navigational features unnecessary.

By Philip Klass

Several important airline radar experts are changing their views on the type of radar the carriers should use. The airlines, they say, need radar primarily for weather and terrain warning purposes, and not for navigation.

This "new school" says the airlines doesn't need all the features and resulting complexity and weight of the military AN/APS-42. But they do think an airline radar should incorporate several new features for better terrain and weather warning, the most drastic of which is the abandonment of the X-band for a new radar wavelength in the 5-6 cm region.

▶**Pros and Cons**—If this new philosophy prevails and the airlines reject the APS-42, it could result in:

- Improved radar storm and terrain warning.
- A lighter, less complex radar designed to airline standards.
- A less costly radar (than the APS-42 in comparable quantities).

But at the same time it might mean:

- A delay in fleet-wide airline radar installations.
- A higher cost program because the airlines would bear the entire cost.
- Reduced radar usefulness for land mapping and no beacon navigation features.

▶**A Surprise**—This development comes as a surprise to many because some of these airline radar experts are the same men who originally prepared the APS-42 spec for the Navy in 1947. At that time, the APS-42 was expected to be the ideal transport type of radar device.

The development may also come as a disappointment to those who had expected to see airline radar go into use in the near future. The APS-42 is the only U. S. transport radar in production today which comes close to airline needs.

Spokesman for the new group is Frank White of the Air Transport Assn.'s Air Navigation and Traffic Control division. White was project engineer of the American Airlines group which tested the old APS-10 and later wrote the original APS-42 spec.

Special Report

Current airline interest in airborne radar is moving into the action phase. The Air Transport Assn. has already prepared preliminary specs for the carriers' comments. Better to understand the capabilities and limitations of existing radar designs, and probable trends in the field, AVIATION WEEK's Avionics Editor has prepared a series of special reports, of which this is the second. It describes a new type radar which some airline engineers think the carriers should buy. Another possible candidate for airline use, the AN/APS-42 Military Transport Radar, was described in the May 12 issue.

▶**Why the Change?**—This change in thinking on the part of some of the men who helped write the APS-42 spec in 1947 is not the result of revolutionary new radar developments or techniques. Nor it is an admission of poor judgment or lack of foresight in preparing the original specs.

In 1946-47, the ballooning airline business was trying to operate with outmoded, over-taxed, prewar navigation aids and communications. Those pilots who flew radar-equipped planes in that period were very much impressed with its capabilities.

Here was a single piece of equipment which could provide ground mapping, terrain warning and storm warning. And if suitably placed radar ground beacons were available, the same device permitted a pilot to fly any desired track and to make instrument approaches.

The uncertainties which surrounded the future of VOR (omnirange), ILS (instrument approach), ground-control radar, etc., in that period only served to heighten the enthusiasm of early radar supporters for their new "seeing eye."

It was in this atmosphere that the spec for the APS-42 was born—a spec for a general purpose radar capable of ground mapping and beacon navigation, as well as terrain and storm warning.

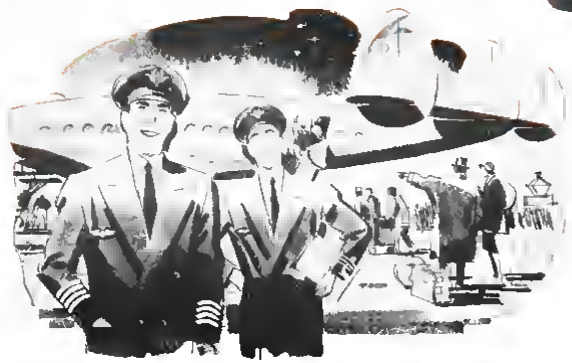
▶**The Reason**—Today all that has changed. New VORs blanket the U. S. All major airports have ILS installations. Some of the more than 50 scheduled installations of air surveillance radar (ASR) and precision approach radar (PAR) are already being used.

(Continued on page 55)

AIR FRANCE

first European airline to equip its fleet for VOR

. . . equipment by COLLINS



The winged sea horse emblem of Air France, the French National Airline, symbolizes more than world-famous cuisine and luxury service. It symbolizes, too, a long record of operational and technical achievement — a record recently embellished by the purchase of Collins 51R-3 receivers to equip the Air France fleet for VOR.

Air France is the first major European airline to fit its fleet with VOR equipment and modern glide slope receivers. In pioneering this great airline advancement in Europe, Air France turned to the leader in VOR for equipment — Collins Radio Company. Collins VOR equipment flies with almost every leading airline in the United States, and the proven reputation of this dependable equipment made Collins the natural choice.

Collins 51R-3, 280 channel, VOR navigation receivers will comprise the major unit in the new Air France installation, with accompanying Collins antenna, accessories and instrumentation providing a system designed for maximum effectiveness and reliability. Utilizing the 51R-3 ILS localizer function, Air France will also install Collins 51V-1 Glide Slope Receivers to complete its installation of modern aids for radio navigation and ILS approach flying.

Collins congratulates Air France on its new VOR/ILS program which is typical of Air France technical leadership in Europe. We are proud that Collins equipment will contribute to this program.

Collins 51R-3 Airborne VOR Receiver

Collins 51V-1 Glide Slope Receiver

IN RADIO NAVIGATION AND ILS EQUIPMENT, IT'S . . .

COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. 42nd St., NEW YORK 18 — 1937 Irving Blvd., DALLAS 2 — 2700 W. Olive Ave., BURBANK

(Continued from page 50)

Distance measuring equipment (DME) and pictorial computers for offset course flying are on their way.

So the "new school" feels that radar's land mapping and beacon navigation features are no longer essential requisites for domestic airlines. (Of course, Military Air Transport Service and international airlines which operate in areas without adequate navigational aids may not want to sacrifice any navigational performance in their radar.)

▶ **New Warning Radar**—The "new school" wants a brand new radar, not a stripped down version of the APS 42. Here is what they would like in their warning radar:

- **Pencil beam only**, instead of APS-42's fan-shape land mapping and beacon navigation beam which would be eliminated, to save antenna weight and complexity.
- **No ground beacon** interrogation. This would eliminate the beacon local oscillator, tuning cavity, and associated automatic frequency control from the radar transmitter.
- **Only one pulse rate** instead of the three pulse repetition rates used in the APS-42. (In the APS-42, one rate is used for short-range precision search, another for weather surveillance and long-range search, the third for beacon operation.) Pulse forming and switching circuitry would be simplified by this step.
- **Single antenna scan rate** instead of two. The slow scan rate which is now used for beacon interrogation would be eliminated.
- **No pitch axis stabilization** and possibly no roll axis stabilization. Roll axis stabilization, a "must" for general purpose radar, is a desirable feature for a weather and terrain warning radar. But if only pitch stabilization is eliminated, there is little overall saving. Assuming that stabilization is completely eliminated, it would save considerable antenna weight and complexity, as well as two servo amplifiers and a vertical gyro.
- **No target discriminator** feature. Pilot could no longer get a "magnified" look at distant targets on the radar scope.

▶ **"Erector-Set" Design**—It is possible to design the radar for "Erector Set" type construction. Airlines who wanted a general purpose radar would add features by adding "black boxes" to convert the warning radar into a more useful device. A radar spec prepared by Lockheed Aircraft for jet transport use reportedly is based on this technique.

White would apply this idea only to the unstabilized antenna to permit the addition of stabilization if it is desired.

This design approach would also simplify the problem of resolving individual airline differences over what features the radar should include. The

'Greatest Invention'

Some years ago, two American Airlines DC-4s and a Pan American Airways DC-4 were experimentally equipped with modified APS-10s. One AA DC-4 operated for seven months on a charter run between Seattle and Anchorage, Alaska.

During this period, AA's Capt. C. A. Lippencott successfully negotiated icing conditions which had turned back other DC-4s without radar. Immediately afterward Lippencott reportedly wired headquarters: "Radar is the greatest invention since the advent of the auto self-starter."

An AA report of this DC-4 operation tells of a heavy snowfall and resulting St. Elmo's Fire which completely blanked out the VHF and LF radio communications equipment. "During this time," the report says, "the airborne radar functioned normally. With no low or medium frequency navigational equipment useable other than the radar, it permitted the flight to proceed using the water-land contrasts (on the radar scope) as ready checks on position."

rub is that such construction usually increases the weight and price of the basic stripped-down design.

▶ **Today's Need**—As the need for navigational radar has diminished, the need for warning radar to spot dangerous storms, icing, and terrain has grown.

Warning radar can put real dollars in an airline's pocket. By consistently avoiding severe turbulence, airlines can build passenger confidence and following. Radar may point out potential areas of hail and thus avoid expensive hail damage, although further research on this use is necessary.

There is another important economic factor. Airliners, experimentally equipped with radar, have proven it possible to fly directly and smoothly through storms which had grounded regular airline flights or sent them hundreds of miles out of their way.

Entry of the Comet jet transport into service early this month emphasizes the fact that high fuel consumption soon will not permit an airliner to avoid a storm by flying completely around it. What's more, at higher jet speeds, there is less time to double-check existing navigation aids—hence more chance for terrain collision. This, plus recent mountain-top accidents, has focused attention on the terrain warning aspect of radar.

▶ **Much Better, But**—The APS-42 is much improved over the early APS-10 when it comes to displaying storm and terrain warning. Its pencil beam searches only those areas of danger to the plane. Its higher power (50 kw.) increases range and will, some experts

ATA/Airline Radar

Desired Operating Characteristics (Tentative)

Ranges	10, 30, 100 naut mi.
Range markers	2, 6, 20 naut mi
RF operating frequency	5 6 000 mc
Peak power	Not less than 40 kw
Pencil beam dimensions	7 deg (conical)
Antenna Scan	Full and ±45 deg sector
Antenna Scan Rate	Approx 60/min
Power Consumption	100 va 400 cps 115 v 700 va. 300-1200 cps 115 v. 60 w 28 v d c
Polarization	Horizontal and circular (switchable to either)
Rainfall gradient contour circuitry is required	

feel, increase the APS-42's ability to penetrate precipitation

The "new school" points to what it calls three APS 42 shortcomings

• **Gradient.** APS-42 does not easily show up the rainfall gradient in various parts of the storm. High gradient (rapid rate of change in rainfall rate) is the thing that makes for turbulence. Without a display of rainfall gradient, airline pilots will find it difficult to locate 'soft spots' to fly through.

• **Echoes.** Under certain conditions, it may be difficult to distinguish a storm echo from a dangerous terrain echo.

▪ **Picture tricks.** The marked attenuation of X-band (3 2-cm) radar energy in heavy rain can play tricks on the radar picture and even hide a mountain from radar view.

▶ **Showing Gradient**—Late in its Navy tests, American Airlines devised a novel method of displaying rainfall gradient. All echo signals above an arbitrary level are inverted, and amplified, and thus 'erased" from the radar scope. This display of equal-echo signal contours is called iso-echo contouring.

Iso echo contouring punches black holes—representing heavy rain areas—in the normally bright rain echo on the scope. This creates a picture in which the dark no rain area surrounds the bright light-rain area which in turn surrounds the newly created dark heavy rain areas (see pictures page 62)

Wherever the light rain echo areas are thinnest, the rainfall gradient is high, because the distance from no rain (dark area), to light rain (bright area), to heavy rain (dark area) is small. (This assumes negligible signal attenuation from the rain.)

▶ **Tests Support Theory**—American Airlines conducted limited tests which supported the theory that by avoiding the areas of squeezed (thin) light rain echoes, a pilot could pick a soft path through storms.

Although this technique displays

only two levels of echo signal, limited evidence to date suggests that wherever the contours are squeezed, the steep rainfall gradient will continue further into the storm center. To add a third iso-echo contour level, it is generally agreed, would unduly complicate the scope presentation.

The iso-echo contouring feature adds little complexity and weight to radar circuitry. But many feel that it adds much to a radar's usefulness.

▶**Storm or Mountain**—The spherical shape of raindrops gives them a useful characteristic in distinguishing between echoes which could be either a storm or a mountain. The APS-42 beam which is horizontally polarized when it leaves the antenna, will be de-polarized when it strikes terrain or a solid object. The de-polarized echo energy is free to enter the antenna on its return.

However, a circularly polarized beam is not de-polarized when it strikes a raindrop. Only its phase is changed. This phase-shifted, still-polarized energy is almost entirely rejected upon returning to the antenna. Thus, if the radar's normal polarization is changed to circular polarization, it will return a reasonably normal echo from terrain, but no echo (or a weak one) from raindrops.

Saved by Radar

A Navy R5D crew is alive today, thanks to its APS-42 radar, BuAer tells Aviation Week. During an instrument approach the control tower operator became confused and gave the pilot instructions to turn right, a course which would have piled up the R5D on a mountain. The pilot checked his radar scope, immediately noted the threatening terrain, and made the correct turn to the left.

By designing the antenna to permit switching from the normal horizontal polarization to circular polarization, the pilot has an instantaneous discriminator to distinguish between a storm echo and a terrain echo. This feature adds some complexity to the antenna design. It wasn't incorporated in the APS-42 primarily because it was developed after the production was well along.

BuAer's APS-42 project engineer, James Grodsky, isn't sure that the increased complexity is justified. He believes that the usual hazy, misty characteristic of rain echoes is sufficient to identify them as such.

But, as an airline representative put it, if the new airline warning radar is to incorporate iso-echo contouring to encourage pilots to seek soft paths through storms, the airlines naturally want to be absolutely certain that the pilot doesn't try to find a "soft path" through a mountain.

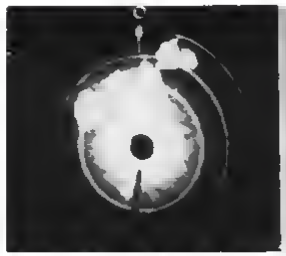
▶**Attenuation From Rain**—The attenuation of radar energy by moisture creates three problems for transport radar.

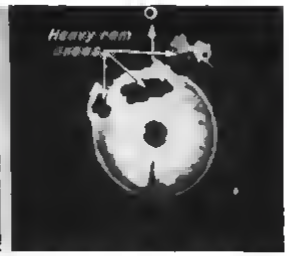
- Heavy precipitation of considerable depth masks dangerous terrain from the radar beam, so the terrain cannot return a warning echo.
- The true depth of a dangerous storm may appear considerably shorter on the radar scope than it actually is.
- It distorts the shape of iso-echo contours. This can cause certain low-gradient areas to look like high gradient (severe turbulence) areas and vice versa.

▶**How Serious**—The experts agree that attenuation occurs in precipitation and that when the attenuation is severe, it causes trouble. But they disagree on how frequently these extreme conditions occur and thus how serious the problem is from a practical standpoint.

Frank White agrees that the problem would be of no practical consequence if rainfall exceeding 20-30 mm per hour were seldom encountered. But he points to recent reports by what he considers to be competent authorities. These indicate that the average thunderstorm has a maximum precipitation rate of 45 mm/hr., or higher. (Previously, rainfall rate of 10 mm/hr has been considered "heavy".)

To show the effects of precipitation





BETTER STORM definition (as in photo at right) is what airlines want from their transport radar. Photo at left shows how storm looks on Navy APS-42 type radar.

attenuation, White says that a 40 mm/hr storm 10 mi deep would be displayed as only 4 mi deep on a 3.2 cm (X-band) radar.

▶ **A Brighter View**—Those who take a brighter view of the problem point out that if rainfall is extremely heavy, it doesn't usually occur in an area of much depth. Another optimistic expression comes from a radar design engineer with a large avionics manufacturer. He told AVIATION WEEK of his company's studies which indicated that a 50 kw X band radar should penetrate about 11 mi into a rainfall area in which the rate was 16 mm/hr throughout.

If the experts could agree on expected rainfall rates, the problem would be easier to resolve. White doubts whether previous techniques in use to measure rainfall rate are sufficiently accurate for radar attenuation analyses. He points to several recent reports to back his strong feelings on the matter.

With such factors as raindrop size and concentration also influencing attenuation, the experts must investigate further before they can find a well-founded answer. The Navy is curious and hopes to find out from tests scheduled to begin soon at their Patuxent, Md., base.

They will run comparative tests using an S-band (10 5-cm.) and X-band (3.2-cm.) radar. The S band radar will serve as the benchmark, because S band energy suffers only negligible attenuation in rain. The Navy hopes to have some test results by this fall.

▶ **The Solution**—If the moisture attenuation problem turns out to be as serious as White and several others think it is, White feels that the new airline radar should move to a new wavelength. In the 1-cm to-10-cm region, attenuation goes down as radar wavelength goes up.

At 10-cm., moisture attenuation is negligible. But using this wavelength would raise other problems of antenna size, beam width, etc. The APS-42's 18-in. diameter antenna is the maximum size for existing transports. Hence White and others think that a compromise wavelength of about 6 cm. is the answer.

Comparing the 3.2-cm. APS-42 with an equivalent 6-cm. radar, White says that in heavy rain (10 mm./hr.) there would be an 8-1 decrease in attenuation using the 6-cm. set. There would be corresponding improvement at higher rainfall rates.

▶ **The Price**—But you never get something for nothing. Changing to a 6-cm. set will reduce the radar's basic clear weather range. It will also double the beam width to about 10 12 deg. This gives more undesirable ground clutter during weather and mountain search operation. It also gives poorer definition for ground mapping.

▶ **Extensive Developments?**—Would a change to 6-cm. radar require extensive development of new techniques and components? Frank White doesn't think so. Qualified radar design engineers to whom AVIATION WEEK put the same question agree with White.

The major changes would need to be made in the RF portions of the radar transmitter and receiver. The waveguide plumbing would need to be doubled in external dimensions. The antenna feed and rotary joint would need redesign. Also, a new 6-cm. oscillator and a 6-cm. magnetron would be required. The oscillator is available and a suitable magnetron is believed under military development.

The feeling of radar industry engineers to whom AVIATION WEEK talked is that a 6-cm. radar would require additional design effort but no major new developments. However, one engineer quickly added that he thinks that "X-band radar will be found the best compromise wavelength" after the dust settles on the 3-cm. vs. 6-cm. argument.

If the airlines buy radar, how soon will they have it in quantity and how much will it cost? How will the decision on which type radar to buy affect price, delivery, and possible military support? Next week's article in this series will discuss these questions.

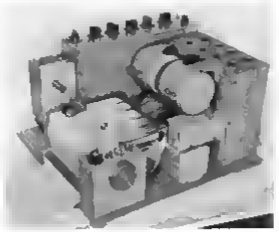
Oval Housing Cuts Capacitor Size

General Electric has cut the size of a new line of capacitors 20 30% and reduced price 10 20% by housing the units in oval shaped cans.

The new capacitors use the same internal construction (paper dielectric) of previous units But GE says they are mechanically stronger because of their drawn-oval can construction which has only a single seam for hermetic sealing.

GE also says the units meet JAN C 25 except for case dimensions and markings The new line is available in sizes of 2.0 to 10.0 muf, rated 600 to 1,500 v d c and 330 to 660 v a c

General Electric Co, Capacitor Dept, Hudson Falls, N Y

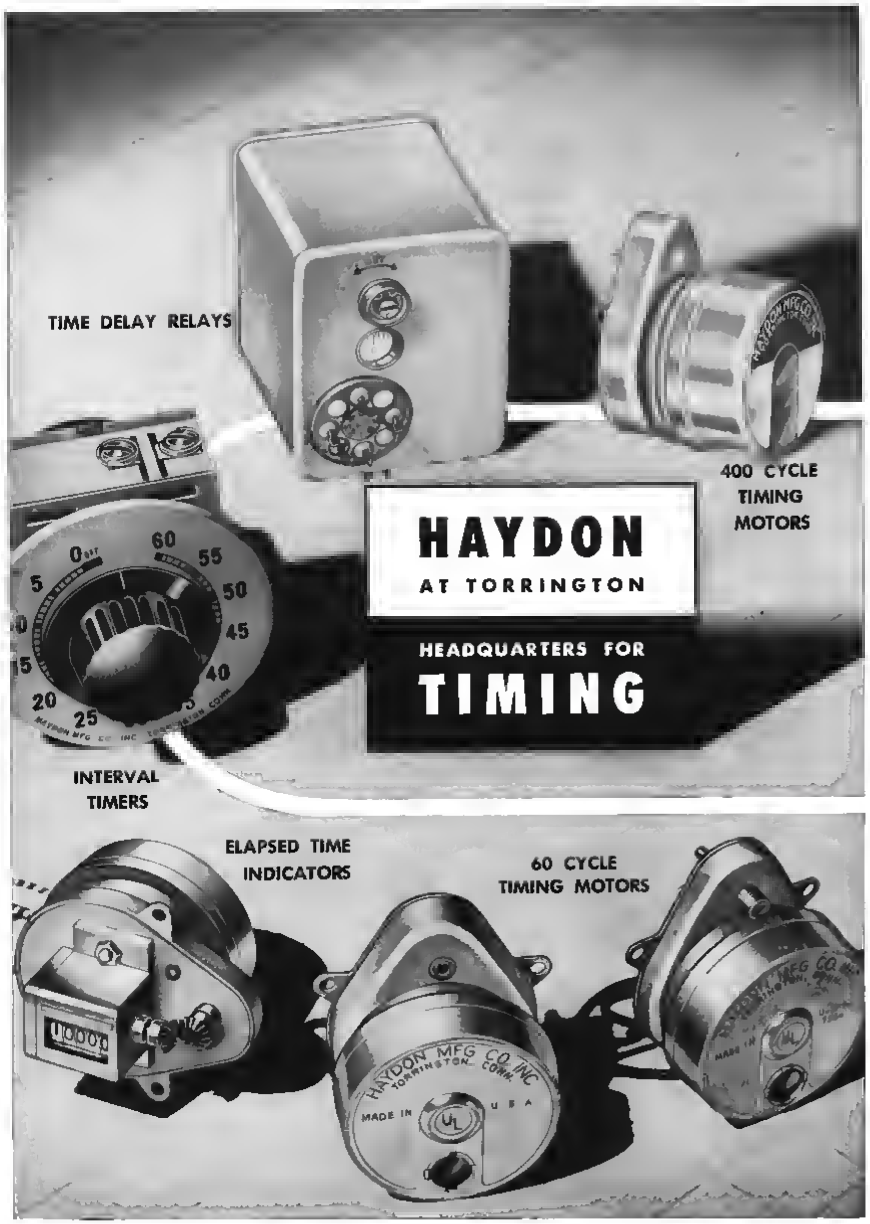


New Recorder

A new multi-channel recorder, designed for a transient signal response flat to 20 cps, has been developed by Rahm Instruments Inc The unit provides three channels for recording transients, five for on-off functions, and one for generating time-scale marks on the chart paper It weighs 78 lb

The recorder provides the operator with a choice of six chart speeds 1, 2, 5, 10, 25, and 50 mm/sec The RO3 E6-1 recorder, as presently designed, operates on 60-cycle power

Rahm Instruments Inc, 12 West Broadway, New York 7, N Y

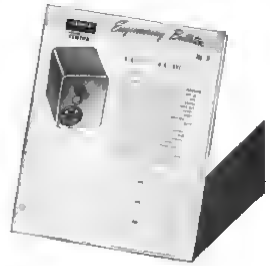


TRIGGER-TRIP
TIME DELAY RELAYS

for 60 and 400 cycle A.C., also D.C.

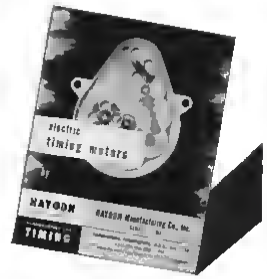
The **HAYDON*** 5103 time delay relay is designed so that the synchronous motor performs its true function as a time standard. Switching work is accomplished by a relay coil, which, when energized, triggers the load switch for release at the end of the delay time. Hair trigger release point assures snap action.

The unit, which measures 2 1/16" x 3 11/16" x 3 3/4" max., weighs only 1 1/2 pounds and is hermetically sealed. It has high initial accuracy and good repeatability, with a wide range of time delays from seconds to hours. Resetting is fast and positive, with reset time uniform for all delay ranges. Load switch may be independent of operating circuit. Designed for military usage. Write for Engineering Bulletin No. 3 for complete information.



TIMING MOTORS

The many advantages of HAYDON timing motors are described in detail in the Timing Motor Catalog, which will be sent upon request. Actual size illustrations show just how small these motors are, diagrams and technical data explain the HAYDON system of controlled lubrication, which is one of the reasons the motors operate in any position. Slow rotor speed permits minimum of gearing for various output shaft speeds, assuring quiet operation and minimum wear. The HAYDON 400 cycle motor is described in detail in a separate publication, Engineering Bulletin No. 2. Write for the literature you need.



TIMING DEVICES

HAYDON specializes in a varied line of standard timing components and custom engineered timing devices for volume application. The basic element of all HAYDON timers is our own rugged industrial motor, which can be depended upon for long quiet operation. Complete engineering data is included in our Timing Device Catalog which will be sent promptly on request. For military applications, various motors are available either separately or in many types of timers; HAYDON engineers will be pleased to review your requirements and specifications.

HAYDON Manufacturing Co., Inc.

Subsidiary of GENERAL TIME CORPORATION

3629 ELM STREET, TORRINGTON, CONNECTICUT

*TRADEMARK REG U.S. PAT OFFICE

How Coating Affects Fire Resistance

Coating System	Fill Ratio %	Dry Weight, (tank plus coating, lb.)	Time Required for Failure (min.)	Remarks
Uncoated	20	7 5	0 35	
B F Goodrich	20	10 3	2	Tank coated by B F Goodrich Co., Akron, Ohio
Stabond Compound	20	10 3	4	Stabond compound No HT-2 manufactured by American Latex Products Corp., Los Angeles, Calif
Albi-RX (water-base)	20	9 0	4 5	Coated with Albi-RX paint and over-coated with Amer-coat Solution No 1322
Uncoated	80	7 5	15	

Tests conducted on aluminum-alloy 10-gal. tanks of elliptical shape.
SOURCE: CAA Technical Development Report No. 59

Full Oil Tanks Resist Fires Better

A full oil tank will resist fire better than a partly empty one. And a properly fitted steel tank gives better protection than an aluminum-alloy one. These are two of the main conclusions reported by CAA's Technical Development and Evaluation Center, Indianapolis, after a series of simulated aircraft accessory section fires.

The fire tests on aluminum-alloy tanks showed that while a 20% full container collapsed in two minutes, one 75% full stood up for 20 min., perhaps long enough for a plane to land in an emergency.

Tanks studied were of steel or aluminum-alloy, with or without heat-resistant coatings, of circular or elliptical shape. They came in sizes from 3 to 10 gal.

In the course of the trials it was discovered that aluminum-alloy mounting straps and brackets were a danger, collapsing nearly immediately and dropping the still intact tanks. The mountings were made of tougher metals for later tests. Gaskets in sumps and filler caps, and composition hose lines were found to fail before the tanks did. Tank shape had no effect on the results.

▶**Summary**—Here is a summary of CAA's conclusions:

• **Remove tanks** from engine accessory section. Regardless of material used in any flammable fluid tank installed immediately aft of the engine can be a serious fire hazard,' the report states.

• **Steel tanks are best,** if location must be aft of engine. Steel tanks, with CAA recommended gaskets and filler caps, were still intact after all the oil had boiled away.

• **Coated, heat-resistant** aluminum-alloy tanks with fuel level high are next best.

• **Uncoated aluminum-alloy** tanks with high fuel level are slightly inferior to coated ones, but many times more effective than similar tanks with low level. One such tank 80% full resisted 2,000F flames for 15 min.

• **Coated tanks** with 20% oil level lasted up to 4½ min., enough longer than an uncoated near-empty tank to permit the fire-extinguishing system to go to work.

▶**CAA Recommendations**—As a result of the tests, CAA makes these recommendations to industry:

• **Replace aluminum** mounting brackets and straps with more fire resistant materials.

• **Install fire-proof** gaskets in oil sump tanks and filler cap assemblies. CAA used Johns Manville No. 76 gasketing with success in the tests.

• **Install vapor-tight filler caps,** good for temperatures up to 2,000F. CAA used a screw-type cap, replacing a quick-opening type which failed in some early tests.

A heat-resistant treatment that showed up well was Albi RX fire retardant paint. In one test where fire buildup was gradual, an uncoated empty tank lasted 2 min., an Albi RX-coated tank 7 min.

Result of the tests was reported by CAA Aircraft division's J. J. Gassman in Technical Development Report No. 59, "Investigation of the Vulnerability of Aircraft Engine Oil Tanks to Accessory Section Fires."

Torque Spanner

(McGraw-Hill World News)

London—A new line of torque wrenches for the aircraft industry has been put on the market by Acratork Engineering Co., Ltd., Corys' Buildings, Cardiff, Wales.

Known as the Acratork Mk. 6 Spanners, these wrenches have been tested and approved by the Royal Aircraft Establishment, Farnborough.

The Mk. 6 wrench has several notable features. It is fully automatic, there being no dial or light to watch and no clicks to listen for. The load to which the wrench is set by the operator cannot be exceeded and it can be used by unskilled labor with precision results, the maker says.

The tool is unaffected by side loads—if pulled out of square the torque load is unaltered. Rapid or slow operation does not affect accuracy, which is maintained to within 1 lb. ft. for over 100,000 consecutive operations at full load.

Operation of the Acratork depends on a cam which rotates between two ball races, and has at one end the male square for attaching to the socket. Running on the cam is a roller housed in a rocker, which is pivoted to the body.

The load is applied by a coil spring pressing the roller down on the cam. In order to turn the handle about the cam, the roller has to force the rocker through means of the cam against the pressure of the coil spring and its adjusting nut. The cam is so constructed that once the pre-set load is applied the wrench becomes free.

The range of Acratork wrenches varies from a small model of 0·3 lb. ft., to a 36 in. spanner for 20-250 lb. ft. Single or double handled types are available and anti-clockwise models can be provided to special order.

A hydraulic type to generate torque loads of 500 lb. ft. and more is being developed.

The company also produces test and setting rigs in various sizes, covering 0-200 lb. ft. and 0-1,000 lb. ft., providing a method of rapidly checking and setting all types of torque wrenches of any make. Test and setting rigs outside standard ranges are made to order.

BLOWER (A) draws vapors from wing tank through tube (B) which is connected to tank opening by adaptor (C). Suction is varied by adjusting gap between blower and tube nozzle (D) which telescopes. Gage (E) tells pressure.

Tank Contents Purged Faster

The job of purging an aircraft fuel tank of vapors and residual fluid has been cut from hours to minutes by a new suction device that can be mounted to the tank opening.

The device should help speed inspection and repair work on tanks and can be used for withdrawing other types of fluids in various applications. It was invented by Bernard T. Gross, director of laboratories at Rohr Aircraft Corp., Chula Vista, Calif., who holds patents.

Consisting of a tube arrangement with a plate to fit the tank opening and a conventional blower to suck the vapors from the tank through the tube, the device combines all components on a single frame which can rest on the wing. Depending on tank construction and other factors, the amount of suction may be varied by adjusting the gap between tube and blower. This is accomplished by telescoping the tube at the blower end. Suction is measured by a permanently attached gage.

The unit first removes the vapors already in the tank and by creating a vacuum vaporizes any residual fluid and draws it out. Essentially it hastens the evaporation process. In other methods, where pressure is used, for example, "vapors forced from the tank . . . are almost immediately replaced by vapors caused by evaporation of the residual fluid . . . Since the natural evaporation of most fluids takes place rather slowly, a great deal of time may be required . . ." George Stell, Rohr patent analyst, claims.

The suction device has proved a major asset in the Rohr "fill and drain" process of applying sealant coatings to the inside of integral wing fuel tanks. The fill and drain process was developed by Rohr to overcome difficulties in spraying, brushing and sloshing.

As Rohr explains, "the suction attachment made it possible to control the thickness of the sealant coating during draining because re-dissolving of the coating by the sealant solvent was eliminated."

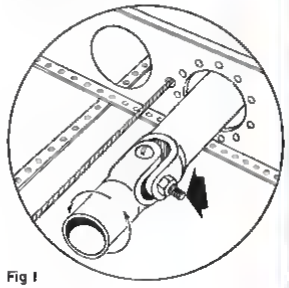


Fig 1

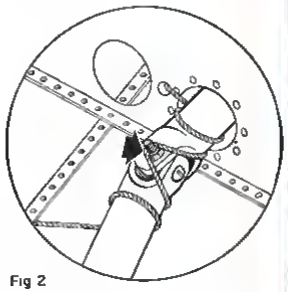


Fig 2

Design Flaw: Bolt Was Too Long

Here is what poor design practice can do.

The wing flap actuating torque tube of a certain type of aircraft was connected to a universal joint by a bolt which was slightly too long. An adjacent elevator cable, unsupported for a considerable length, was able to whip (Figure 1).

Result: as flaps were retracted after takeoff, elevators of the plane jammed, causing extremely rapid climb. As luck would have it, a service representative of the manufacturer was aboard the aircraft. Sensing the relation between flap retraction and rapid climb, he returned flaps to takeoff position, releasing elevator cable.

Reason for jammed elevator is shown in Figure 2.

NEW AVIATION PRODUCTS

Tube Voltmeter

A new vacuum tube voltmeter, reportedly offering greater stability and accuracy than previous types and designed to replace several different sets now used by combining their functions, has been developed by Southwestern Industrial Electronics Co.

The equipment—the Model R—primarily is intended for measuring d.c. volts, from 1 v. full scale to 1000 v. full scale. But it also permits accurate measurement of d.c. millivolts on complete scales, a.c. volts and millivolts, ohms and megohms. Further it is equipped with distended scales for reading small percentage changes in d.c. voltages and provides for improved accuracy in reading resistance.

Power requirements for the Model R are 105-120 v. a.c., 60c, 80 w. The unit measures 13¾x10¾x9 in., weighs 34 lb., and is priced at $620 f.o.b.

Southwestern Industrial Electronics Co., 2831 Post Oak Rd., Houston 19, Tex.

Riveting Costs Cut

A control device for pneumatic rivet guns used in aircraft work improves quality of riveting, yet speeds production and saves time in training new operators, according to its maker, G. A. Braun, Inc. It is called the Predetermined Rivetimer and sells for $37.50.

The control allows the rivet gun to hammer only a preset number of times, then automatically interrupts air power to the gun, no matter how long the operator continues to squeeze the trigger or button.

The 11-oz. device can be installed quickly in the handle of any standard, air-operated percussion gun, says Braun, whether it is a pistol grip, offset or push-button type. Adjustment of hammer blows to take account of variations in rivet size and other factors is accomplished simply by a calibrated wheel on the unit, locked in place by a spring clip.

An earlier tool has seen considerable field testing in aircraft plants, and has been used in limited numbers, Braun says. A prototype of the Rivetimer originally was developed toward the end of World War II by the Prosperity Co., parent firm of the Braun company. The present model is the first to be scheduled for full-scale production by the company.

G. A. Braun, Inc., Syracuse, N. Y.

Jet Fires Prevented

An improved insulation for reducing fire hazards in jet aircraft has been developed at Chance Vought Aircraft div. of United Aircraft Corp. It is now being used by CV on the Cutlass, Navy tailless fighter.

The insulation is wrapped around hot pneumatic lines and keeps heat from entering the engine compartment. The product is a new combination of materials, including Fiberglas and aluminum foil. According to CV, it has reduced weight by 15 lb. on the Cutlass, costs about 30% less than old-type covering, and won't soak up oil. It has resisted heat continuously at temperatures up to 600F.

The material was developed by E. V. Chartrand, structures materials engineer for the company. The problem of fire prevention in interior areas where engine and hydraulic oil may come in contact with hot air lines has caused jet aircraft manufacturers considerable trouble. Existing insulation had a tendency to absorb oil and cleaning solvents, so that instead of protecting, the insulation became a fire hazard, Chartrand says. Also it became heavier from absorbing the fluids.

Chartrand experienced difficulties at first in developing the new insulating blanket. A major one was that the aluminum foil outer surface was easily punctured. He overcame this by adding a protective coating to the foil and an adhesive to the edges.

Chance Vought Aircraft div. of United Aircraft Corp., Dallas, Tex.

Missile Timers

Lightweight, compact timing mechanisms, already put to use in guided missiles for a variety of jobs, have been put into production by Masco Products Co.

According to the firm, the timers—mechanical devices using miniature precision-cut gears—are programming fuel valve actuators, telemetering devices and destructors, besides filling other missile requirements.

Masco is making various models with timing intervals from 15 sec. to 24 hr. It claims a high accuracy for the units (within 1 sec.) even under acceleration loads up to 50G. They measure 1½ in. in diameter, 1¾ in. in length.

The company manufactures other missile components including miniature gear trains.

Masco Products Co., 2119 Sepulveda Blvd., Los Angeles 25.

ALSO ON THE MARKET

High accuracy tachometers for turbine overspeed tests and similar precision speed measuring needs are accurate to ¼% of speed being measured, according to maker, Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.

High-strength-weight plastic products, available from Reflin Co. in Fiberglas-reinforced tubing and other forms, can be used for airborne housings, tubing for fuel, oil lines and other applications, says firm. They resist corrosive liquids and gases and wide range of temperatures. Address: 5825 Higuera, Culver City, Calif.

Cold test chamber can cool components down to −100F and up to simulated altitudes of 85,000 ft. Altitude chamber is separate, portable unit (2 cu. ft.) fitting in 8-cu. ft. cabinet. Conrad Industrial Coolers 262 West 12th St., Holland, Mich.

Electric drills for aircraft repair and assembly work have ¼ in. capacity, come with pistol grip, spade and center contour handles and are supplied in various speed ranges from 600 to 5,000 rpm. Drill motors are designed so that in combination they blanket wide range of assembly line drilling needs. Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill.

"Up-ender" attachment for fork trucks permits operators to pick up, transport and stack heavy drums without leaving seat. It rotates drums for vertical or horizontal stacking, tilts them for emptying. Baker-Raulang Co., 1250 W. 80th St., Cleveland, Ohio.

LETTERS

Carriers and MiGs

Your article on Naval Aviation Feb. 25 had one statement which indicated you might not be aware of certain instances which have already occurred in Korea. At the bottom of p. 28 you make the statement that "If the Navy ever expects to send bombers over enemy territory, the escorting fighters will have to ward off interceptors the equal of or better than the MiG. . . ."

In November, 1950, the Navy did just that. At the time I was Commanding Officer of the Leyte, and our air group, consisting of Douglas Skyraider dive bombers, Vought Corsair fighters and Grumman Panther jet fighters, in company with planes from the Valley Forge and Philippine Sea air groups, made several attacks on the bridges across the Yalu River at Sinuiju on the extreme opposite corner of Korea from the Sea of Japan where the carriers were operating.

These bridges were defended by MiG-15 aircraft as well as by intense anti-aircraft from both sides of the river. As you know, we were unable to reply to the anti-aircraft fire from the Chinese side of the river or to chase the MiGs across the river. Our air groups made numerous attacks on these bridges.

On several occasions, in addition to the anti-aircraft fire, our air groups were attacked by MiG-15s. There were at least three days when our jet fighters, which were covering our dive bombers, engaged MiGs attempting to shoot down both dive bombers and jet fighters. When the final score was in from these battles, our jet fighters had shot down three MiGs for certain and had probably damaged several others. It is interesting to note that one MiG was shot down by each carrier air group.

The remarkable thing is that none of our planes were shot down by the MiG-15. The jet which had this remarkable record against the MiG was the Grumman Panther jet. It was not only able to protect our bombers, but had a score of three to nothing in combat with the MiG, and this occurred in December, 1950. I do not mean to state that the F9F-2 is better than the MiG, it is not, but nevertheless here is the record.

These actions, incidentally, were not widely publicized and are generally not well known. . . . As you know the first MiG was shot down by an Air Force pilot on Dec. 8, 1950. The next day the Navy shot down a MiG. This was done by a pilot from the air group of the Philippine Sea, and on the 18th, two MiGs were shot down—one by a pilot from the Leyte, my ship, and one by a pilot from the Valley Forge. As I said previously, in addition several MiGs were damaged in these battles.

As you pointed out in your article, the Navy is making progress in modernizing its aircraft inventory, but we do not consider that Naval Aviation is ineffective today. We believe we can deliver dive bombing attacks covered by jet fighters to the combat radius of our aircraft. It has already been done, as I can assure you that the intense anti-aircraft fire and the large number

of MiG aircraft defending the Yalu bridges was a most formidable defense and not likely to be exceeded in the near future.

It is interesting to note that in these battles the MiGs and the covering jet fighters became involved in the dogfights while our dive bombers were attacking the targets. It was most comforting to us to find that since the MiGs were fully occupied with the jet fighters they were unable seriously to molest our dive bombers or to stop our attack.

In several instances MiGs fired upon the dive bombers, but with the hot time our Grumman Panther jets were giving them, they fortunately missed. I do not mean by this to infer that the Grumman Panther jet can outperform the MiG, but I do say that on the record it has a three-to-nothing or a three-to-one advantage over the MiG in combat. (I believe since I left Korea, one Panther jet has been shot down by MiGs.)

These experiences indicate that the coordinated attack of a carrier air group is just as effective now against potential opposition as it was during World War II, and I feel certain that the Navy can and does expect to "send bombers over enemy territory" to the limit and range of our aircraft.

CAPT T. U. SISSON, USN
Washington 25, D. C.
Office of CNO-Op-50
Navy Department

'The Fun Is Gone'

My subscription has expired. AVIATION WEEK was the last remnant of my connection with aviation.

About 32 years ago I made my first model airplane. Somehow it flew—ten feet or so. To me that was the beginning of a career. Aviation was my game. I hung around the airports—when they built them. I learned to fly. And finally I went to school. My diploma reads "Bachelor of Science in Aeronautical Engineering."

Aviation was fun in those days. An "aircraft plant" was any old shed out by the local cow pasture known as "The Airport." There might be as many as a dozen employees. Each of us had a salary, and sometimes we got it in full. Other times we took what there was and waited for the rest of it.

Sometimes we made some drawings and built an airplane. Other times we made an airplane and then made some drawings. When the airplane was ready, we took turns flying it, and each one made his own critical list of faults. Then more work to correct the plane. Several good airplanes were developed that way. Some of them developed into substantial manufacturing companies. Some were bought up by the established larger companies. Others found the going too rough and went bankrupt. But through it all there was fun, men doing a job they loved.

There were plenty of rough times. A number of times, I can recall, all hands turned out to overhaul an airplane for some owner-pilot, the fee would help to meet the payroll. There was one time when the president of our company visited my landlord, talked him into another two weeks credit on my room. I'd been locked out for being six weeks in arrears on the rent. But I still had a job, if I could hold out until some money came in.

to meet the payroll

Then came another war! Suddenly, aviation was big business. The cow pasture sprouted concrete runways. The old shed gave way to a huge modern plant covering several acres. The dozen employes became a dozen thousands.

As engineer, I retired to a distant hall, away from the activities of the manufacturing plant, and still farther away from the flight line.

Almost overnight, instead of working on all parts of the airplane, I became a specialist on fittings for the wing structure. Once in a while, I got permission to take a walk out into the shop. But, for all practical purposes, I was the same as the others around me, some of whom had never been off the ground. They were all specialists on some particular part of an airplane, but few cared what the airplane itself looked like. It was 8 to 5 and a paycheck every Friday.

Came the end of the war. The company had several millions in cash in the bank. There were several plants operated by the company. Each plant had several hundred engineers. But the company had no business. Uncle Sam had quit buying. Plants were promptly closed. One plant was left in operation. When Uncle Sam bought an airplane, engineers were hired to design it—still on a specialty assembly line basis. When Uncle changed his mind, engineers were 'laid off.' There was no job security. Wages were larger—when we worked, and we got them on schedule. But tomorrow could bring termination pay and a layoff.

In 1947 I swore I'd had enough. I called myself a Mechanical Engineer and went to work designing paper mill machinery. Then, in 1948 I got the itch again. Uncle had tentatively agreed to buy an airplane from a nearby aircraft company. I couldn't stay away. In June I went to work—on wing fittings. In November, Uncle changed his mind, $4 million in tooling was thrown away; 1,000 engineers became 150. I quit again. I've not been connected with aviation since, and I don't think I will ever do it again. There's no fun in it. There's not much fun in my present job either, but it pays better than the aircraft companies are offering, and Uncle hasn't started to cancel out on Atomic Energy Plant contracts.

I'm not renewing my subscription to AVIATION WEEK because it reports the ashes of the game I loved. I'm not flying much anymore. I had a Cub coupe before the war. It cost plenty then. I figured a minimum income of $65 was needed to afford to own an airplane just before the war. At more than twice that income, I can't afford to even rent a plane now. I've been in the air three times since 1947, each time as a paying passenger on an airline.

This is a lot of sour grapes, isn't it. I admit to being sour. I once believed we could build an aircraft industry on sales to people who wanted to fly. But, the war put "business men" in control of the game. They sell to Uncle, a sure pay customer. They won't take any chances on developing airplanes that 'might' sell to people as individuals—because they 'might not' buy. They even want an Armed Forces development contract to underwrite the cost before they undertake to develop a commercial carrier. And there's no fun in it anymore.

T. F. P.

WHAT'S NEW

New Books

The Fireside Book of Flying Stories, edited by Paul Jensen. Published by Simon & Schuster, N. Y., 464 pages, price $3.95.

Here is a superb collection of three dozen short stories, essays, vignettes and reports of the best vintage covering aviation from the balloon days, through World War I, the barnstormers and adventurers, World War II, and flying for sheer enjoyment. Edgar Allan Poe, John Dos Passos, Sir Arthur Conan Doyle, Charles Nordhoff & James Norman Hall, Floyd Gibbons, Saint-Exupery, James Thurber, Clostermann, Beirne Lay, Jr., and Langewiesche are represented.

The book's format makes it a fine traveling companion, since there's a story to fit just about all moods. And it's interesting to note that whether they were flying balloons, wood-and-canvas-and-wire "crates" or World War II's "million-dollar toys," the flyer's reactions to being airborne were pretty much alike.

The author's background, 260 hours of long range bomber escort work in World War II, four enemy aircraft to his credit, no doubt helped him in assembling this collection of gems. It is regretted that, with his extensive art experience, he did not include a few pertinent illustrations to liven up the presentation.—EJB

Trade Literature

A new 28 page booklet is available which describes the basic characteristics and application of selenium rectifier stacks. The booklet, designated as GET-2350, was prepared by G-E's Lighting and Rectifier Dept. It contains background and design data on the principles of operation, characteristics, circuit design, and application of selenium rectifiers. Available from General Electric Co., Schenectady 1, N. Y.

Publications Received

• **D C Power Systems for Aircraft**, by R. H. Kaufman & H. J. Finison, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1952, $5.00. A study of aircraft power systems from the viewpoint of how the individual electrical devices work together to make up the complex power system.

• **Aviation Fuels & their Effects on Engine Performance**, prepared by Ethyl Corp., 1951. A discussion of the more important properties of aviation fuel in relation to engine operation, design and development.

USAF CONTRACTS

Following is a list of recent USAF contracts announced by Air Materiel Command.

Aluminum Co. of America 1200 Ring Bldg., Washington, D. C., aluminum sheet, $40,393.

American LaFrance Foamite Corp., 180 E. LaFrance St., Elmira, N. Y., fire extinguisher foam charges $69,850.

Aro Equip. Corp., Bryan, Ohio, wrench, pneumatic, 2,000 ea., $107,600.

Bayley, William, Co., 1200 Warder St., Springfield, Ohio, bomb shackle 28,427 ea., $386,577.

Beatrice Steel Tank Mfg. Co., 700-710 S 7th St., Beatrice, Neb., cargo bins, 200 ea., $97,215.

Beech Aircraft Corp., Wichita, aircraft, $1,000,000.

Boeing Airplane Co., Seattle, kits, $250,280.

Borg Bauland, Corp., Chicago, amplifier, 1,444 ea., $142,120.

Borg-Warner Corp., 1100 E. Seymour St., Muncie, Ind., machinery & equipment, $1,000,000.

Breeze Corps., Inc., 41 S. 6th St., Newark, N. J., actuator, shaft assy., indicator assy., $34,820.

Brewe, Gordon D., & Assoc., 941 No. Foothill Rd., Beverly Hills, Calif., strap assy-lifter, webbing, $93,874.

California Eastern Airways Inc., Oakland, Calif., kits, $1,403,013.

Celanese Corp. of America, New York, cellulose sheets, $281,028.

Chrysler Motors, Los Angeles, wing flaps, $597,080.

Cincinnati Milling & Grinding Mach., Inc., Cincinnati, milling machines $443,754; parts, pump assy., $55,370.

Paslochio Aviation Corp., 8051 W Century Blvd., Los Angeles, tank assy., $1,875,000.

Cole Laboratories, Inc., 40-60 Ninth St., Long Island City, N. Y., acid, $182,509.

Continental Can Co., Coffeyville, Kan., spares, $105,341.

Continental Mfg. Co., 2011 W Mechanic St., Harrisonville, Mo., shock assembly 30,000 ea., $313,500.

Cribben & Sexton Co., 700 N Sacramento St., Chicago 12, insert assy., metal containers, $118,060.

Dayton Rubber Co., Dayton, tube assy., $114,482.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., photographic paper, $50,250.

Eclipse Pioneer div., Bendix Aviation Corp., Teterboro, N. J., indicator 3,401 Ea., $484,597; fuel flow indicator $208,073; indicator 5,073 ea., $310,581.

Fletcher Aviation Corp., Pasadena, Calif., tank assy., $3,331,200.

Ford Motor Co., 3000 Schaefer Rd., Dearborn, Mich., engines, $25,000,000.

General Electric Co., Schenectady, flap indicators, $48,555; frequency meters, 810 ea., $40,328; tachometer indicator, $76,156; generator, 3,000 ea., $70,027.

Goodrich, B. F., Co., Troy, Ohio, machinery & equip., $200,000.

Great Lakes Mfg. Co., 1848 E 284th St., Cleveland 16, switch, $28,034.

Grimes Mfg. Co., Urbana, Ohio, contact & cover assy., band assy., $34,000; light assemblies $84,510.

Gessmann, David R., 185 E. 44th St., New York, cloth, $880,000.

Hartman Elec. Mfg., Mansfield, Ohio, current cutouts, 8,402 ea., $110,217; current cutouts, $420,310.

Industrial Air Products Co., Portland, Ore., breathing oxygen $28,104.

Interstate Engr. Corp., El Segundo, Calif., assembly washer, $240,201.

Jack & Heintz, Inc., Cleveland, starters 1,040 ea., $210,000; generators tachometer, $15,043; inverters 847 ea., $148,084; actuator assemblies, 800 ea., $332,076.

Kaiser Aluminum & Chem. Sales, Inc., 910 N. Michigan Blvd., Chicago, aluminum sheet, $34,906.

Kidde Walter & Co., Inc., 675 Main St., Belleville, N. J., cylinder & valve assy., $48,178.

Kollsman Instr. Corp., Elmhurst, N. Y., machmeters spare parts, 1,731 ea., $100,000.

Lewis Engr. Co., 339 Church St., Naugatuck, Conn., indicator temp., 1,784 ea., $39,129.

Manning-Bowman div., McGraw Electric Co., Fostoria, Ohio, tube pitot static 1,110 ea., $24,119.

Mauri Corp., The, New York, fire extinguisher foam charges, $342,500.

Minneapolis-Honeywell Regulator Co., Minneapolis 13, transformer assy., $382,665.

Monarch Mfg. Co., 234-240 E. Chicago St., Milwaukee 2, jackets, flying, 8,000 ea., $48,285.

Monsanto Chemical Co., Springfield, Mass., cellulose sheets, $42,900.

Phaostron Co., 151 Pasadena Ave., S. Pasadena, Calif., switch, 7,370 ea., $217,544.

Pittsburgh Plate Glass Co., Pittsburgh, glass items, $328,472.

Pyrene Mfg. Co., 10 Empire St., Newark 5, fire extinguisher, $276,800.

Radioplane Co., Van Nuys, Calif., target aircraft, $4,543,500.

Republic Aviation Corp., Farmingdale, L. I., N. Y., airplanes $1,000,000; components $500,000.

Romec div., Lear Inc., Abbe Rd., Elyria, Ohio, pump, water injection, $117,418; pumps, $179,799.

Sperry Gyroscope Co., div. Sperry Corp., Great Neck, L. I., modification kits, $15,985.

Standard Electrical Prods. Co., Dayton, relays, 392 ea., $57,543.

Starco Chemical Co., 4003 Navigation, Houston 13, compound, carbon removal, $132,725.

Stover Rubber Co., 7851 E. Monroe St.

Anaheim, Calif. link assy $53,338

Taylor Forge & Pipe Wks., Chicago engine rings $358 000

General Electric Co., Utica N Y, machinery & equipment $1 250 000

Floyd A Holes Co Bedford, Ohio metal foil bags $01,755, $48,105

Law Paper Co. Dayton photographic cardboard mount, 100 428, $42,450

E Leasager & Co, Chicago demand mask to regulator tube 32 511 $78 834

Link Aviation, Inc, Binghamton, N. Y. spare parts $80,063

Mall Tool Co., Chicago generator sets, 1,643, $1,059 405

Mosler Safe Co, Hamilton Ohio safe office $264,108

Redmond Paper Co. Highland, Calif, metal foil bags 2 420 000, $81 801

Republic Aviation Corp. Farmingdale, L I, N. Y., F-84X airplanes & spare parts, $8,000 002

Reynolds Metals Co., Richmond Va., aircraft forgings, $10,070 880

William Sellers & Co., div. Consolidated Machine Tool Corp. Rochester grinders, 100 $52 200

Shellmon Products Corp., Mt. Vernon, Ohio metal foil bags, 1,800 000 $89 528

Westinghouse Electric Corp., Dayton alternators, voltage regulators 381, 371, $581,282, voltage regulators, 15,485, $588,-791

Turco Products Inc., 8135 S Central Ave., Los Angeles 1, paint remover $138 108

Turner, Albert & Co., Inc., New York, field uniform $138 128

United Wire & Supply, Providence 7, copper & brass wire. $71,880

Universal Electric Corp Owosso, Mich., machinery & equipment $175 680

Utica Drop Forge & Tool Corp., Utica, N Y blades $1 302 000

Vulcan Elec. Co, 83 Holten St. Danvers, Mass, gun heater, 4 276 ea., $88 773

Westinghouse Elec Corp 32 N Main St., Dayton generators, 1 285 ea. $538 264

Weston Electrical Instr Corp 614 Frelinghuysen Ave., Newark N J, bulb, temperature, 5 482 ea $55 750

American Airmotive Corp Miami Springs, Fla., observing dome, 1,650, $42,875, aircraft parts $26,157

Anchor Packing Co., Detroit, commercial hardware, $27 875

Arctic Fur Co., Seattle, fur wolf strips, 8,250 $85,587

Atlantic Parachute Corp., Lowell Mass. parachute 8 500 $2 082 258

Bachman Wholesale Co Rochester, N Y, gun chargers, 1 881, $105 105

Bowser Technical Refrigeration, Inc, Bowser Inc. Terryville, Conn., humidity test chamber $37 712

Brono New York Industries Corp, New York wattmeter $437 758

Bochsbaum S., & Co., Chicago, container $1 041 250

Boescher Band Instrument Co, Elkhart Ind altimeter 11 704 $750 000

Carborundum Co Niagara Falls commercial hardware $71 140

Cirillon Building & Supply, Inc, Fort Wayne Ind aircraft apparatus $32 288

Concord Supplies & Equip Corp, New York container 12,285 $1 240 100

Dayton Blue Print Co, Dayton, table drawing $34 448

Division Lead Co., Chicago, pig lead $70 308

Domont Aviation Associates Long Beach, Calif aircraft generators $43 400

Du Pont, E I, de Nemours & Co, Inc, Wilmington, Delaware, methyl alcohol, $157 508

Eclipse-Pioneer div, Bendix Aviation Corp Teterboro N J indicator, 4 857, $743 512 indicator 1 881 $124 783,

Elsner, Sigmund Co Red Bank N J parachute $1 470 758

Fashion Frocks, Inc, Cincinnati parachute 9 126, $1 486 875

Fletcher Aviation Corp., Pasadena Calif fairing assembly $85 170

Foster, L W Sportswear Co, Inc., Philadelphia suit flying 3 200 $20 900

General Electric Co, Schenectady, spare parts, $2 848 818 generator, 5 737, $140 597

Harris-Seybold Co., Cleveland, collator, $31 150

Holley Carburetor Co, Detroit, miscellaneous parts, $281 976

Instruments div, Thomas A Edison Inc, West Orange, N J, temperature bulbs $274 385

International Latex Corp Dover, Del bladders $81,383

Irving Air Chute Co., Buffalo parachute, $1,227 050

Joyval Manufacturing Co., Denver, parachute $1 237 500

Johns-Manville Sales Corp, New York, commercial hardware $87 645

Kollsman Instrument Corp, Elmhurst, N Y, machmeters, $179,717

Leland Electric Co, Dayton 750 va inverters, 811 $280 288, inverters, 253 $139 821.

Linde Air Products Co., New York breathing oxygen $182 213

Loewy Construction Co Inc, New York, presses, $20 258 137

Lycoming-Spencer div Avco Mfg Corp, Williamsport Pa, kit $91 785

Merlin-Rockwell Corp., Jamestown, N Y, bearing $30 088

Metal Hose & Tubing Co Dover, N J., hose $81 808

Mine Safety Appliances Co., Pittsburgh hood assy, 1,420, $42,368, oxygen masks, $277 487

Minneapolis-Honeywell Regulator Co, Minneapolis, Pressuretrol $142,533

National Safety Council, Inc., Chicago ground safety material $27,008

New York Air Brake Co, New York hydraulic pumps $42 570

Nichols, W. H., Co., Waltham, Mass., parts, $48,420

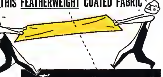
North American Aviation, Inc, Los Angeles, special tools, $26,872

Onsrud Machine Works, Inc, Chicago routers and drills, $82 806

Oshkosh Trunk & Luggage Oshkosh, Wis., container, 12 800 $1,253,000

YOU CAN'T TEAR

THIS FEATHERWEIGHT COATED FABRIC



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Vulcan's newly developed **"COVERLIGHT"** combines extremely light weight (only 5½ ounces per square yard) with exceptionally high resistance to tearing. Tensile strength also is unusually high.

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"COVERLIGHT" is a nylon fabric, coated with synthetic rubber. Get your sample of this "featherweight" waterproof fabric that is so tough you can't tear it. Also available in 6½, 10, 12 and 14 ounce per square yard. *Write for complete specifications and samples.*

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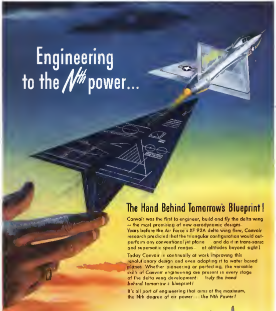

The Hand Behind Tomorrow's Blueprint!

Convair was the first to engineer, build and *fly* the delta wing — the most promising of new aerodynamic designs. Years before the Air Force's XF 92A delta wing flew, Convair research predicted that the triangular configuration would outperform any conventional jet plane ... and do it in trans-sonic and supersonic speed ranges ... at altitudes beyond sight!

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CONSOLIDATED VULTEE AIRCRAFT CORPORATION

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☆ ☆ CONVAIR IS ADDING ANOTHER 1½ MILLION SQUARE FEET OF FLOOR AREA TO ITS PLANT FACILITIES ... MAKING A TOTAL OF MORE THAN [illegible] MILLION SQUARE FEET DEVOTED TO RESEARCH AND PRODUCTION PROJECTS FOR AIRCRAFT, GUIDED MISSILES AND ELECTRONICS [illegible]

FINANCIAL

Non-Aviation Enterprises Studied

Some stockholders are beginning to ask management what it plans to do if military spending should slump.

Ventures by major aircraft companies into non-aviation fields have once again become a topic of discussion at recent shareholders' meetings.

Such talk is, of course, academic in the main, since the aircraft industry seems assured of as much work in the aviation field as it can handle for the next few years at least. Nevertheless, some stockholders have voiced concern over the plans of their companies in the event of a possible letdown.

▶ **Stockholders' Questions**—One such shareholder at the recent Grumman meeting asked just what the company was prepared to do should it suffer the loss or serious reduction of its military orders. Grumman's president, Leon A. Swirbul, replied that the company was exploring possibilities in the non-aviation field where its engineering talents could be usefully applied. This is about as direct an answer as could have been expected, for, under present circumstances, the aviation effort dwarfs all others.

At another stockholders' meeting, that of Consolidated Vultee, Chairman Floyd Odlum stated in answer to a shareholder's query that his company, too, was pursuing other projects for investigation when a slack develops in military order placements. These other projects are in addition to an automotive venture which might result from a talked-of merger with Kaiser-Frazer and Atlas Corp.

For the present, however, the aircraft industry as a whole is mightily and primarily concerned with the production of aircraft and components.

▶ **Past Efforts**—Non-aviation enterprises are nothing new for the industry. For, with the notable exceptions of Boeing, United Aircraft and Douglas, most companies in the immediate postwar years launched various diversification projects as military business dried up and disappeared. In 1946 the industry found itself faced with the problem of utilizing war born production facilities and investing sizable bank balances. The swing into other fields was one attempt to find a solution.

• **Bell Aircraft**, for example, moved into production of washing machines, small gasoline engines, powered prime movers, and phonograph cabinets. At a later date, it acquired a gas appliance parts manufacturer and insurance company. For one reason or another Bell has given up all but the latter two, success here has been pretty much confined to the appliance parts business.

• **Convair**, which currently seems to have the only active plans to diversify into non-aviation fields, made some of the biggest similar postwar moves. One of the boldest steps was acquisition of control of ACF-Brill Motors Co., which produced buses, trucks and truck engines. It also agreed to produce for its former affiliate, Avco Manufacturing Co., kitchen stoves and other appliances. Neither of these developments proved profitable and by 1948 Convair had disposed of its ACF-Brill holdings and abandoned all non-aviation activities.

• **Fairchild Engine** which continued to operate a profitable business throughout the difficult postwar period, did so despite its experiment in the manufacture of radio cabinets, bicycles and rowboats. These operations were all suspended—with losses—in 1947.

• **Grumman** entered the fields of aluminum truck bodies, canoes and rowboats after the war, with negligible success. The truck body venture proved more profitable than the rest but never succeeded in accounting for more than 4% of revenues. The manufacture of boats has been dropped and fewer truck bodies are being made mostly because of the aluminum shortage.

• **Glenn L. Martin** at the end of the war delved into plastics through the formation of a chemical division, and into television broadcasting through cooperation with Westinghouse's Stratovision project. Neither of these ventures survived very long. The chemical business was sold to U. S. Rubber and Stratovision has been abandoned.

• **Northrop Aircraft** through its subsidiary Snyder Motors attempted to enter the motor scooter field. This company was liquidated in 1948 after a loss of more than $1 million.

• **Ryan Aircraft** planned an entry into casket manufacture in the postwar period, but this venture, too, was a short-lived one. After a $534,000 loss in 1947 the project was discontinued.

▶ **Successful Ones**—However, not all non-aviation enterprises proved disappointing. One important exception was

Lockheed's $5 million investment in Pacific Finance Corp. Though totally unrelated to the aviation field, the venture has returned a steady profit to Lockheed.

In the same category is Sperry's 1947 purchase of the New Holland Machine Co., manufacturer of farm equipment. This investment has contributed substantially to Sperry's postwar earnings and is continuing to do so.

On the whole, however, non-aviation diversification by the aircraft industry has not met with much success. This, of course, does not assure that future moves along similar lines will follow the same pattern. But the stockholder naturally must regard the past as indicative of the future and cannot be blamed if he regards non-aviation activities with a somewhat skeptical eye. Most observers agree that an aircraft company stockholder expects management to stick to aviation, with the success or failure of the company depending to a large degree upon the direction of aviation activities, and not diversification.

During the foreseeable future, excursions into other than aviation fields by the aircraft industry will remain little more than a conversation topic. The immediate problem of producing aircraft is far more important.

—Selig Altschul

Allison Reports New Turboliner Progress

- **Prop control problems have delayed project.**
- **But transport now is piling up flight time.**

TURBOLINER: Allison is shooting toward 1954 certification of turboprop transport.

Steady headway toward safe, powerful U. S. turboprop transports is described by Allison division, General Motors Corp., in a progress report reviewing the first 53.5-hr. flight operation of the Allison Turboliner, first U. S. turboprop carrier.

The airplane, basically a Convair 240 except for its powerplant installation, was purchased from Convair. The two manufacturers jointly made the installation of Allison T38 turboprop engines and Aeroproducts propellers in modified nacelles. In its new configuration the Turboliner made its first flight Dec. 29, 1950.

Here are some highlights of recent findings on performance:

- **Maximum continuous power** 30% greater than the warranted power rating of the R2800 engine in conventional Convairs.
- Speed 30 mph. faster than the regular Convair, at 15,000 ft.
- **Practical range over 1,200 mi.**, with no increase in present Convair 240 fuel tank capacity of 1,500 gal.

Higher performance would result from reducing the nacelle size to take advantage of the engine's smaller frontal area.

Allison's assistant chief of installation engineering, D. J. Nolan reported the test results in a paper presented to the SAE National Aeronautic Meeting in New York last month.

He supports the conclusion of British European Airways chief executive Peter Masefield that maintenance and overhaul should be less costly than for the piston engine, and operating cost also should be less "soon."

▶ **Problems**—"Of all the flight characteristics which posed new problems, none was of greater consequence or of more serious implications than the problem of windmilling drag," Nolan says.

So the most vital requirement is for foolproof automatic feathering. The drag of a turboprop windmilling after power failure in first tests pulled the plane down at 900 ft./min., while the pilot had to hold full aileron and rudder. Later, test pilots found that if power were reduced on the good engine, control was better, but initial descent was 2,000 ft./min., after power was applied to hold speed of 120-125 mph., descent decreased to 400 ft./min.

"From these tests it can be seen that assurance of feathering should be available for commercial operation in case of emergency," Nolan says.

And quicker feathering is needed for safety in case of a power failure in takeoff, Allison found. To eliminate prohibitive drag and possible loss of control, Allison developed a "decoupler;" it is a torque-sensing device that decouples the engine from the prop when a torque reversal occurs. This means less drag than a windmilling conventional prop with a reciprocating engine.

To speed up changes in blade pitch, hydraulic pressure in the prop control was increased from 3,000 psi to 4,000 psi.

While this gave the needed speed, it was too high for routine maintenance and materials in the hydraulic system. So the propeller blades were trimmed to reduce "twisting" action against which the hydraulic blade pitch control had to work. This allowed reduction of the hydraulic pressure again, and cut takeoff thrust only 2-3%.

▶ **Turning Point**—As the slow development went on, reliability appeared years off. But Nolan says a turning point came with tests of the overspeed governor propeller control.

The overspeed governor is a protective control to take over if the electronic governor fails. Tests showed that it gave fully stabilized and safe engine operation, although at higher engine speed than normal. This worked even when the electronic control failed in such a position as to give the wrong signal to the propeller.

After this test, Allison decided to go ahead with planned improvements on the Turboliner. They put in new production engines, replacing the prototype engines used in the first 50 hr. of test (23 flight hr.). They put the reworked propellers on the plane, added a new coordinating control on the power section and installed electronic torque meters.

Then followed 30 more flight hr., during which the performance data summarized above were gathered. With 53½ hr. of flight test time on the plane, it went through tear-down and inspection last February.

▶ **British Ahead**—The British are way ahead of the Turboliner development. British European Airways plans to start scheduled operation of the Vickers Viscount late this year. The Viscount has the small Rolls-Royce Dart engine, which is simple enough to reduce problems involved in prop control and engine icing.

The long-range turboprop Bristol Britannia is expected to make its first flight this summer and start scheduled operation in 1954. It has the Proteus engine, which Curtiss-Wright is licensed to build.

Meanwhile, neither the Pratt & Whitney T34-powered Lockheed Constellation under Navy development contract nor the Air Force Douglas C-124B with the same engines are expected to fly for at least another year.

▶ **Which Comes First?**—Successful flight testing of the Turboliner, though not yet near commercial reliability, again poses the question of which will come to scheduled U. S. airline operation

first—the pure turbojet or the turboprop Jet engine development and control already is reliable, but there is no U S transport airframe built for it. The Super Constellation, Martin 4-0-4 and Convair 340 airframes are ready for turboprop, but engine-prop control reliability is still in early development, is indicated in this Allison Turboliner progress report

Allison expects rapid development toward commercial certification of the Turboliner after next January Convair then starts production of the military trainer version of the Turboliner—the T-29, with T38 power The Turboliner may be ready for certification by 1954, an Allison spokesman says

Propeller engine control—formerly the biggest bugaboo of turboprop aircraft—is no longer Allison's major problem The prop decoupler, constant speed prop control, reworked propeller and overspeed control have made prop-engine control adequate, even with an engine failure during takeoff it is reported

The slowness of development on the Turboliner is caused by priority given military work, Allison says For instance, Allison has no spare power section, controls or gas turbine compressor units for the Turboliner it has only one spare propeller

▶ **Other Turboprops**—However, Allison plans to pick up time on the Turboliner from now on—has about 70 hr on it now

Other Allison turboprop planes now in flight test are three Navy contra rotating T40 installations—the P5Y flying boat A2D attack plane and the A2J A-bomb carrier Air Force T-29 trainer and C 130 all purpose transport will have the T38 engine

Allison plans to try Hamilton Standard and Curtiss-Wright props on the Turboliner later—after they are satisfied with the marriage of the Aeroproducts prop and T38 engine The Air Force T-29 contract calls for Ham Standard props on the T38 engine

As to the British lead on turboprop operation, U S manufacturers say the British engines are much heavier, simpler and less efficient than U S models and are manually-controlled The U S turboprop engine prop combinations have a single control for pitch, power and engine speed, and they have been provided with automatic feathering and prop decoupling

CAB Grants PanAm $919,000 Back Pay

Civil Aeronautics Board has added $919,000 temporary back mail pay for Pan American's Latin division operation Apr 5, 1948, to Feb 29, this year, making total payment for the four-year period $25,440,000

This is the amount shown by Pan American on Form 41 reports to the Board as its need to break even during the period

Pan American originally asked a $3,777,750 increase from the $24,521,000 already paid but did not object to the CAB show cause order last February proposing $1,001,000 Although the figure now is set at $919,000, it may be changed later, as this is only a temporary rate

The increase is specifically to cover the nine-month period April-December, 1948, which CAB previously had denied

Post Office contested the PanAm estimates of break-even need on grounds that the Board had frequently found PanAm's reports unreliable and on the expensive side But the Board points out that this happens with many carriers reports to varying extents

FLYING BARN?

When this American Airlines Convair was damaged in Charleston W Va, due to nosegear collapse, the carrier's maintenance staff faced a major repair problem How to work on the ship in midwinter with no hangar facilities available AA negotiated with a local contractor to put up this temporary aluminum-covered steel framework structure to protect the repair crew it moved in from its Tulsa maintenance base

Committee Attacks Plane Noise Problem

CAA Administrator Charles Horne has announced that the recently established National Aviation Noise Reduction Committee is a permanent group that will work for immediate operating improvements and long range research coordination Aim is to cut aircraft noise nuisance at airports

At the first business meeting, the committee's four subcommittees (AVIATION WEEK Mar 17, p 79) outlined the scope of their jobs

Initial plan of attack on the noise problem breaks down this way.

- **Operations Committee** 1 Study the effect of traffic patterns on noise reduction in normal operations, instrument approach and missed approaches 2. Eliminate training flights over congested areas when other areas are available 3 Use preferential runways with cross wind components up to 15 knots. 4 Intensify pilot training emphasis on noise reduction methods
- **Technical Committee.** Will collect and integrate research information affecting noise
- **Airport Committee** Will wait for the President's (Doolittle) Airport Commission report, then carry on after this temporary commission is finished
- **Public Education Committee** Will collect data on the places where noise is a problem and publicize efforts to help that local situation

Members at the first meeting were Horne and Deputy CAA Administrator Fred Lee Albert J Forte, assistant to the Administrator, Adm Emory S Land president of ATA, Paul V Betters, U S Conference of Mayors; C V Burnette, American Municipal Assn, Capt A F Foster, ALPA, J B Hartranft AOPA, Col Paul C Ashworth, USAF, and Col J J McCabe, USAF

Agencies with representation on the committee ATA, AIA, ACTA, U S Conference of Mayors, ALPA, AOPA American Municipal Assn Airport Operators Council Navy, Air Force White House and CAA

Subcommittee chairmen and secretaries are Operations—Stanley Seltzer, ATA, and W B Sprague, CAA Technical—A W Dallas, ATA, and Stephen H Rolle, CAA; Airports—unassigned, Public Education—chairman unassigned, secretary, Ben Stern

Next meeting will follow the Doolittle Commission report to the President late this month

(Meanwhile, the Acoustical Society of America warned at a New York meeting of a new noise threat when jet transports go into service Complaints will come from a much greater radius around airports)

Western Asks CAB Ruling on Rebates

Western Air Lines has asked CAB to rule whether Western should comply with the California Public Utilities Commission order to rebate "overcharges" on intra-California coach tickets sold Mar 1 May 9 last year But CAB doesn't want to take a position for or against the state claim of jurisdiction on intrastate fares

Western previously asked CAB general counsel for advice on this, but got no answer

The problem arose when WAL and United Air Lines raised their Los Angeles-San Francisco coach fare from $9.95 to $11.70 on Mar 1, last year, in conformance with a CAB edict The California PUC didn't approve the fare increase until May 9

The Public Utilities Commission said the higher fare was illegal during that month-and-a-half period, ordered rebates wherever it was possible to grant them

The carriers said they couldn't serve two masters and they believed CAB had the higher authority on fares of interstate airlines

But the ruling from California courts was that they must get PUC approval for an intrastate fare increase the courts based this conclusion on a provision of the state constitution requiring such approval for fare increases The U S Supreme Court refused to take the case, asserting that there was insufficient federal question involved for them to intervene

Western now asks CAB if the fare rebates would not be in violation of the Civil Aeronautics Act, which prohibits rebates In an earlier informal letter, CAB had suggested that Western ask the Board for an exemption from the Act's provision with regard to this case

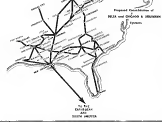
Deccan Airways Crash Findings

(McGraw-Hill World News)

Bombay—Crash of a Deccan Airways Douglas DC-3 at Dum Dum Airport last Nov 21 is attributed to the plane hitting trees on the south southeast portion of the field while executing a missed approach procedure after attempting to make a landing in poor visibility

Eleven of the 13 passengers and four of the crew were killed in the crash, a survivor died later

The investigating committee has recommended that airline operators take action to establish weather minimums, especially as regards Dum Dum, in view of the incidence and nature of fog which predominates in the region



PROPOSED DELTA-C&S MERGER

Proposed merger of Delta Air Lines and Chicago and Southern Air Lines would give the combined company a network of more than 9,500 route mi (above) Presidents of the two airlines have announced a consolidation agreement, to be submitted to their stockholders and Civil Aeronautics Board for approval Both companies operate principally in the South, and Delta has international routes to Cuba, Puerto Rico and Venezuela Delta also has a merger agreement pending with Northeast Airlines, and both Delta and C&S have petitioned for the purchase of Capital Airlines' southern routes.

Seven Airlines Give Top Salary Details

Airline executives' incomes reported to CAB for 1951 show that

- **Ralph S. Damon,** TWA president drew salary of $84,999 and bonus of $25,838, up from 1950's $84,166 salary and $17,999 bonus
- **S C Kennedy,** president of Hawaiian Airlines, had salary of $28,250 and bonus of $240 compared to a $27,525 salary in 1950
- **H. S. Darr,** president of Frontier Airlines received a salary increase to $24,000 from 1950's $14,000
- **C M Belinn,** president of Los Angeles Airways had salary of $16,125 compared with 1950's $15,000
- **R F Tongg,** president of Trans-Pacific Airlines received an increase to $15,125 salary as against 1950's $5,000
- **Eddie Hamilton,** president of Ozark Airlines drew salary of $12,250 and bonus of $180 compared with 1950's $5,000 and $200
- **E V Underwood,** president of Robinson Airlines, received a salary of $12,000 compared with $10,166 in 1950

Details including present stock holdings of all executives of these seven airlines (1950 in parentheses) as reported to CAB

▶ **Trans World Airlines Inc.**—R S Damon president and director salary $84,999 bonus $25,838 director's fee $1,000 holds 2,500 common shares ($84,166 bonus $17,999 fee $500 1,900 common shares) Warren Lee Pierson chairman of the board and director salary $64,999 bonus $24,035 director's fee $700 holds 2,600 common shares ($64,791 bonus $16,710 fee $400 2,000 common shares) J A Collings executive vice president and director salary $45,625 bonus $10,000 fee $900 holds 801 common shares ($44,583 bonus $12,770 fee $400 and 401 common) E O Cocke vice president—sales and director salary $28,020 bonus $12,434 fee $900 holds 700 common shares ($27,201 bonus $8,174 fee $500 400 common shares) T K Taylor vice president salary $14,937 and bonus $2,941 (no 1950 report) G L Gilmore vice president salary $14,583 and bonus $3,199 (no 1950 report) D W Harris vice president salary $15,770 and bonus $2,970 (no 1950 report) G H Clay secretary salary $17,812 bonus $9,103 holds 400 common shares ($17,205 bonus $4,205 and 200 common shares) M J Plodenic controller salary $15,582 bonus $3,093 ($14,870 and bonus $2,077), E M Constable, treasurer salary $14,987 and bonus $3,260 ($13,874 and bonus $1,924) and the following directors Fred W Ayres, director's fee $500 and bonus $11 ($200 and bonus $6.42) Palmer Bradley fee $900 and bonus $11 ($800 and $11) Powell Crosley fee $200 bonus $11 holds 1,120 common shares (fee $500 bonus $11 and 1,120 common) Noah Dietrich fee $100 bonus $11 (fee $800 and bonus $11), A. B Eisenhower fee $800 bonus $11 holds 120 common shares ($700 bonus $11 and 120 common) Oscar F Holcomb fee $500 bonus $11 (fee $500 and bonus $11) A V Leslie* fee $400 bonus $11 holds 800 common shares (salary $28,708 bonus $4,330 fee $400 300 common) Sidney Maestre fee $800 bonus $11, holds 120 common shares ($500 bonus $11 and 120 common) Harry Rogers fee $1,000, bonus $11 (fee $500 and bonus $6.42) A D Simpson fee $1,000 bonus $11 and 120 common shares (fee $300, bonus $11

128 common), Thomas A Slack, fee $22d bonus $11 (fee $200 and bonus $5 42) N S Talbot fee $400 bonus $11 holds 120 common shares (fee $700 bonus $11 120 common) Loyd Wright, fee $400, bonus $11 holds 24d common shares (fee $400 bonus $11 and 240 common) *Was officer in 1950, also received bonus of $1,742 which was remainder of bonus paid in 1950

▶ **Hawaiian Airlines, Ltd**—S C Kennedy president and director, salary $28 250 bonus $240 holds 101 780 common shares (salary $27 025) Ford Studebaker, vice president, salary $15,75d, holds 6 000 common shares $14 100), David Watson vice president-treasurer salary $10 250, holds 7 280 common shares ($11,150); John S Pugh secretary salary $8 320, holds 2,500 common shares (no 1950 report) Brian Cooke, assistant treasurer, salary $8 241, 1 000 common shares ($7 24d) and the following directors M B Cereso bonus $100 holds 27,500 common shares James M Greenwell bonus $220, holds 2,750 common shares T Guard bonus $80 no stock Dudley C. Lewis, bonus $200, holds 600 common shares P K McLean bonus $120 holds 1 000 common shares, J E Russell bonus $100 no stock W C. Tsukiyama, bonus $200 holds 250 common shares, George Vicars, bonus $22d, holds 2,760 common shares H V Von Holt, bonus $140 holds 3 500 common shares R. Von Tempsky bonus $040, holds 200 common shares H W F White, bonus $10d, no stock G P Wilcox, bonus $8d, holds 20 775 common shares Robert T Williams, bonus $140 holds 25d common shares, and George S Wong bonus $040 holds 3 285 common shares. (No 1950 reports on directors.)

▶ **Frontier Airlines, Inc**—H S Darr president and director salary $24 000 holds 3 300 common shares ($14 000 and 3 300 common) C A. Myhre, executive vice president, treasurer and director salary $10 410 no stock ($5 833), R M Wilson vice president—operations and director salary $9 600, holds 100 080 common shares ($5 832 holds 110 310 common) D A Duff vice president—traffic and director salary $9 900 holds 10 common shares ($5,833 holds 10 common) E N Levin, secretary and director no salary holds 163 743 common shares (no salary 163 740 common) D T Myers assistant secretary, salary $1,883 and 30d common shares ($1 385 34 common) E W Sexton assistant treasurer salary $4 356, no stock ($2 08d), and the following directors F Monaing, 8 000 common shares (6 000 common) D E. Webb, 750 common shares (750 common) L W Linville 600 common shares (59d common)

▶ **Los Angeles Airways Inc**—C M Belinn president and director salary $16 125 holds 8 800 common shares ($15 000 and 8,670 common) Martin J Burke secretary and director no salary holds 3 700 common shares (no salary 3 750 common) Wayne H. Fisher treasurer and director no salary 2 850 common shares (no salary 2 850 common) Emerson B Morgan director holds 1 000 common shares (1 000 common)

▶ **Trans-Pacific Airlines, Ltd**—Ruddy F Tongg president and director salary $15,120 holds 44 331 common shares (88 000 and 41,831 shares) David A. Benz executive vice president and director salary $14 253 holds 8 00d common shares (88 000 and 8 000 common) H K Kee vice president and director salary $8 d75 holds 10 000 common shares ($5 750 and 10 000 common) Archie K Wong, secretary and director salary $4 000 holds 4 00d common shares ($1 775 and 4 000 common) Clarence D Young treasurer salary $7 500 holds 800 common shares (no 1950 report) Richard C Tongg vice president and director holds 10 000 common shares (10 000 common) Daniel Ahoa vice president and director holds 4 000 common shares (4 000 common) Hung Wei Ching vice president and director, holds 11 000 common shares (11 000 common) Sia Chow Dee, vice president and director holds 15 000 common shares (15 300 common) Jacob Y Ing vice president and director holds 58 000 common shares (58 000 common) Katsumi Kometani vice president and director holds 5 000 common shares (5 000 common) A. Paul Low vice president and director holds 24 805 common shares (24 80d common), and the following directors Y Baron Goto, 6,000 common shares (2,005 common), Kan Yen Chun, 3 000 common shares (3,000 common), Edward L. Lau, 17 750 common shares (18 200 common) and Charles Boettcher II, 6 000 common shares (6 000 common)

▶ **Ozark Air Lines Inc**—B T Mattingly chairman of the board bonus $1 300 no stock (bonus $800 and 120 000 common shares) Laddie Hamilton president and director salary $12 2a0 and bonus $100 ($5 000 bonus $200 and 26 000 common shares) A. G Heyne, secretary and director bonus $1,050 (bonus $500) F W Jones treasurer and director salary $7,200, bonus $50 00 (salary $3 000 bonus $200 and 378 000 common shares) J F Cerl, vice president and director salary $3 000 and $120 bonus ($4,000 and $200 bonus) C. W France vice president and director salary $8 250 and bonus $2 820 (no 1950 figures) and the following directors O L Parks, bonus $100 (salary $1 300 and bonus $80) O O Shaver, salary $5 561 and bonus $140 ($1 900 and bonus $80) C A. Backmer no report for 1951 (salary $1 040 and bonus $80)

▶ **Robinson Airlines Corp.**—E. V. Underwood president and director, no salary and 2 000 capital shares (2 000 capital) Robert Peach executive vice president, salary $12 000 holds 620 capital shares ($10 160 and 620 capital) John R Carver vice president and secretary salary $8 409 holds 010 capital shares ($7 200 and 010 capital) C A. Bencoter vice president—operations, salary $10 00d holds 85 capital shares (no 1950 report) W D Bosworth treasurer no earnings 1951 or 1950 H S Goldsmith assistant treasurer salary $5,800 (no 1950 report), and the following directors L. N. Simmons, director and general counsel salary $300 holds 350 capital shares (35d capital). Edwin A Link no 1951 earnings (10 303 capital) Joel H Carroll 1 875 capital shares (1 870 capital) Ralph C Smith, 400 capital shares (400 capital)

SHORTLINES

▶ **Air Transport Assn.** reports interline sales clearances of $27,243,245 this March, up 24% over a year ago. . . ATA members will require passengers to confirm reservations within six hours of takeoff on stop-overs and return trips, starting about July 15 They expect CAB to approve this first effort to reduce the proportion of "no-show" passengers who make reservations then fail to appear

▶ **Air Coordinating Committee** may add Army to its membership But some ACC members, notably AF may object, insiders say ACC coordinates U S civil-military air policy only by unanimous vote, and voting members already number six—CAB, Commerce, AF, Navy, State and Post Office

▶ **California Central Airlines** has CAA approval to boost overhaul time on its Martin 2 0 2s' R2800 engines from 1,100 to 1,200 hr They started the Martin operation with 1,000 hr limit last summer

▶ **Capital Airlines** April load factor of 58½% compares with 61% a year ago

▶ **Civil Aeronautics Administration** Office of Aviation Defense Requirements says the only controlled materials shortages looming for the third quarter this year are copper mill wire and structural steel wide shapes . . OADR says NPA regulations allow airport owners in flooded areas to self-authorize extra allocations for repairs

▶ **Eastern Air Lines** will raise its one way aircoach fares $1 effective June 1 or before Complexity of adjusting joint and roundtrip fares after CAB approval last month caused the delay. Regular fares were adjusted first Capital, another heavy night coach operator, already has filed for the $1 raise on coach fares

▶ **International Civil Aviation Organization** reports that nine of 50 critical navigation facility deficiencies were filled by member nations at ICAO request last year. Some 15 more will be fixed shortly, ICAO reports . . . Expects Japan to ask for membership this year after the necessary six month wait from Apr. 28, date of Japan's regaining national sovereignty

▶ **Oakland Airport** is installing a surveillance radar delivered this month, expects precision approach radar soon . . . Is planning more runways to route traffic away from crowded areas, and will construct a new $3-4 million "functional and not necessarily monumental" terminal building

▶ **Pan American World Airways** application to serve American Samoa was denied by CAB

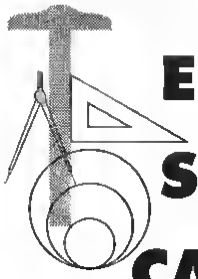
▶ **Resort Airlines** is offering vacation package tours for 15% down payment the rest to be paid off in 10 monthly installments Any travel agent handling Resort business can make credit plan arrangements Resort has guaranteed all agents immediate commissions Plan starts June 14

▶ **Scandinavian Airlines System** has ordered six more Douglas DC 6Bs, they're to be 81-passenger trans-Atlantic coaches like PanAm's SAS now has 14 DC 6Bs on order, with first delivery due this month, the last slated for early 1954

▶ **TPA Aloha Airline** April traffic gained 90% over a year ago to 188,659,000 revenue passenger miles

▶ **United Air Lines** has added "leg rests" on its Stratocruisers

▶ **U. S Airlines** has won CAB approval of military passenger contract flights; CAB previously denied the all-cargo line's application, but has granted it to Nov 1 after reconsideration



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AVIATION WEEK—MAY 19, 1952

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Private flight research organization offers unusual opportunity for graduate engineer with minimum 3 years experience in flight test analysis work. Involves diverse activities associated with flight control study work. Submit resume Box AW 697, 221 W. 41 St., NY 36

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EDITORIAL

Chaos Supreme

Reports coming to AVIATION WEEK *from all directions this week indicate CAA officials are now worried about this magazine's continuing program of public enlightenment on how the Office of Aviation Safety is bumbling in the vital job of maintaining and improving air safety. They should be. The OAS needs a house cleaning. Meanwhile, we continue our avowed policy of focusing the searchlight of publicity on exactly how OAS's top administrators, W. S. Hensley and William Davis, "masterminds" important technical problems under their jurisdiction, although neither has any up-to-date flight or technical or engineering experience. The following letter is from an experienced pilot and technician, within the OAS.—R. H. W.*

'Recently, there have occurred a considerable number of filter failures in some fLS receivers. When a filter fails the visual indications available to the pilot in the cockpit are unreliable, i.e., the localizer needle may indicate the aircraft is on course when it is actually off course.

"The potentialities of any such unreliable indication when making an instrument approach are obvious.

'There are 'double check' procedures commonly used and when a pilot finds that his ILS receiver is giving him unreliable indications he does not make an ILS approach or, in the event he has already started the approach, he discontinues it and pulls up to a safe altitude.

'He then decides whether to make a low-frequency range approach, GCA approach, ADF approach or to go to some other airport, depending upon the equipment available in his aircraft, weather conditions, and other factors.

"On Apr. 24, 1952, Messrs. Hensley and Davis apparently found out there have been a considerable number of filter failures. No doubt, they applied their 'administrative' and 'executive' talents to this discovery and priority dispatches were hurriedly sent to the field raising the minimums from 200 ft. ceiling one-half mile visibility, to 300 ft. and three-fourths mile visibility for airlines using Collins 51R-2 fLS receivers.

"This must be accident prevention with a capital P. It implies that it is safe to descend to 300 ft. with a bad ILS receiver. It suggests compensating for the bad receiver with an additional 100 ft. ceiling and a quarter-mile visibility.

"In actuality, of course, the effect of flying into an off-course obstruction several hundred feet high (if the pilot should make an instrument approach with a bad receiver) would be about the same whether the ceiling happened to be 200, 300, 400 or 500 ft. at the time.

"Two days later, Messrs. Hensley and Davis apparently discovered that some airlines have two 51R-2 ILS receivers installed in their aircraft. So another hurried dispatch was sent to the field saying that the increased minimums do not apply to those airlines.

"Two days later (Apr. 29), Messrs. Hensley and Davis apparently discovered that at some airports GCA precision approach radar is installed and operated. So along came another rush dispatch saying that the increased minimums would not apply in those pertinent cases where GCA monitoring is available and utilized by the pilot. But that isn't all!

"Still another message was sent out instructing the inspectors to 'request the affected airlines to amend their operations specifications to reflect the increased minimums immediately.'

'Two days later everybody got another message which said a letter from an airline would be satisfactory in lieu of the amendments to the operations specifications.

"There were also two or three additional messages which were sent out on the same subject—chaos supreme.

"One of the field inspectors has pointed out to Hensley and Davis that some airlines use the Collins 51R-1 receivers and that these contain the same filters used in the 51R-2 receivers. Apparently Hensley and Davis have to apply special 'administrative' and 'executive' talent to this factual information because increased minimums on this date (May 14) still apply only to airlines equipped with 51R-2 receivers.

"Is it any wonder that the public, the airline pilots, the industry and the CAA inspectors have lost faith in the management and direction of OAS? How long will these people be permitted to issue instructions, recommendations and suggestions in the name of the U. S. government?'

Engineers Desert Region 3

Another letter to AVIATION WEEK

Alexander McSurely's article, 'Engineers Scarce in Top OAS Jobs' Apr. 14 was intensely interesting to us, since we are so intimately acquainted with some of the conditions enumerated in it.

Your reference to M. B. Hall, Chief, Aircraft Engineering Branch, Region 3, was particularly interesting. The pity of it all is that you only touched the surface of the difficulty.

We would like to know why the following Third Region engineering personnel quit CAA, transferred to other regions, or accepted military duty:

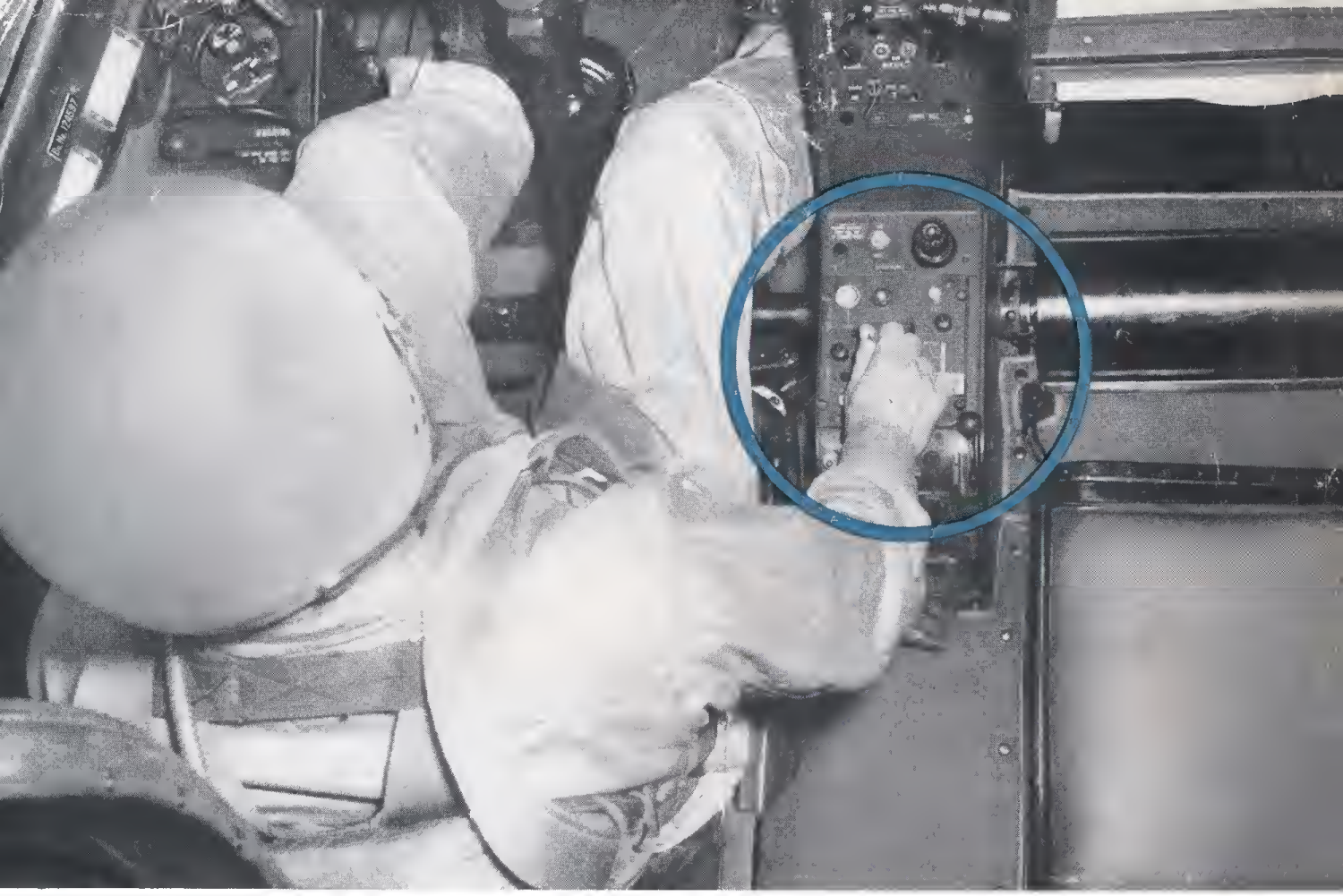
- R. J. Anburn, Chief, Powerplant Engineering
- J. C. Battaglia, service representative
- J. W. Davidson, engineering flight test
- A. A. Goodier, powerplant engineer
- W. F. Norton, engineering flight test
- R. E. Schlemmer, Chief, Engineering Branch
- G. L. Strehl, aeronautical engineer
- R. A. Peterson, powerplant engineer

Can all these men be wrong? These are some of the men who left but rest assured, there will be others unless M. B. Hall . . . [or his replacement] practices what CAA supervisory training courses teach.

Almost all of the dissension and dissatisfaction in OAS could be eliminated if administrative personnel practiced the principles outlined in supervisors' courses given in each region by Washington office personnel.

It is a pity that all of OAS's dirty linen must be washed in the public press, but if that is the only way it can be done, then let it be so. CAA is like any other organization, there are a few bad apples that contaminate the whole organization. We can honestly say that, by and large, OAS personnel are competent, conscientious and as fine a group of people to work with as will be found in any comparable group in industry.

CAA Employes in the Third Region



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A new autopilot, the General Electric G-3, is now in operational use in Douglas F3D-2 Skynights and is being installed in Grumman F9F-5P Panthers. It is scheduled for Grumman's new swept-wing F9F-6P, Douglas's A2D Skyshark and other hot Navy planes.

In addition to the main requirements of high speed flight—such as suppressing or eliminating "dutch roll" and high-frequency oscillation—the G-3 incorporates additional control features. It includes continuous automatic synchronization, automatic altitude control, "level-out" and "maneuver-holding" provisions, and allows for wide-angle attitude of autopilot engagement.

All-electric, the G-3 was developed and produced by General Electric in close cooperation with the Navy's Bureau of Aeronautics. It is now in mass production in G-E plants.

The G-3 autopilot is another in the long line of G-E products engineered for the aviation industry by men who know the needs of the air. Whether your needs are for a single generator or a complete bomber defense system —or anything in between—it's a good idea to call your General Electric aviation specialist. *General Electric Company, Schenectady 5, New York.* 210-40

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